

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開2001-56707

(P 2 0 0 1 - 5 6 7 0 7 A)

(43) 公開日 平成13年2月27日 (2001. 2. 27)

(51) Int. Cl. ⁷	識別記号	F I	テーマコード (参考)
G05B 19/418		G05B 19/418	Z 3C042
B23Q 41/08		B23Q 41/08	B 3F022
B65G 1/137		B65G 1/137	A 5B049
G06F 17/60		G06F 15/21	R

審査請求 未請求 請求項の数 8 O L (全 15 頁)

(21) 出願番号	特願平 11-233187	(71) 出願人	000000527 旭光学工業株式会社 東京都板橋区前野町 2 丁目 36 番 9 号
(22) 出願日	平成 11 年 8 月 19 日 (1999. 8. 19)	(72) 発明者	中村 一夫 東京都板橋区前野町 2 丁目 36 番 9 号 旭光 学工業株式会社内
		(74) 代理人	100098235 弁理士 金井 英幸

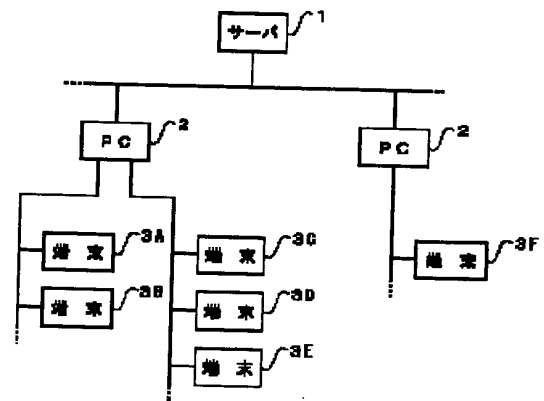
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(54) 【発明の名称】 工程管理システム

(57) 【要約】

【課題】 工程内の不良品を追跡可能な工程管理システムを、提供する。

【解決手段】 前工程における製品を部品として使用して製品を製造するとともに、得られた製品を次工程へ搬出する各工程に対応させて配置された各端末 3 A ~ 3 F、及び各端末 3 A ~ 3 F に接続されたサーバ 1 により、工程管理システムを構成した。各端末 3 A ~ 3 F は、各工程における製造が開始された時刻を取得する時計 M を有する。そして、各工程の工程名、当該工程における製品の製造時刻、及び得られた製品が後続の工程において部品として使用される際の使用時刻を、一組の管理データとしてサーバ 1 及び端末 3 A ~ 3 F に保存する。この管理データを基に、各工程内及び各工程間の物品の流れが特定される。さらに、この管理データを基に、各工程内に様々な状態で存在する不良品が追跡される。



【特許請求の範囲】

【請求項 1】前工程から出力物として出力された物品を入力物として夫々処理するとともに処理により得られた物品を次工程へ出力物として出力する各工程を管理する工程管理システムであって、

前記各工程における入力物に対する処理時刻を取得する複数の計時手段と、

前記各計時手段に夫々接続され、各工程を一意的に示す工程名、該工程名が示す工程における処理時刻である第 1 の処理時刻、及び、当該工程からの出力物に対する次工程における処理時刻である第 2 の処理時刻を、一組の管理データとして記憶する記憶手段とを備えることを特徴とする工程管理システム。

【請求項 2】前記物品は、複数まとめられた状態で、出力物として出力されるとともに次工程において入力物として受け入れられ、この次工程において、任意の数量抽出されて処理され、

前記管理データは、複数まとめられた状態の前記物品に対応し、相隣接する各工程間において一意的に自他識別可能であるとともに相隣接する各工程間を移動する前記物品に対応させたローカル識別子を、さらに有することを特徴とする請求項 1 記載の工程管理システム。

【請求項 3】各工程内、及び相隣接する各工程間において、前記物品は、複数まとめられた状態で、前記ローカル識別子が付された格納体に格納され、

前記ローカル識別子を読み取る読取手段を、さらに備えたことを特徴とする請求項 2 記載の工程管理システム。

【請求項 4】前記制御手段は、所定の工程において所定の処理時刻に処理された出力物が指定されるとともに当該工程を遡った上流側の原因工程が指定された場合、前記所定の工程の前工程を示す工程名を有する管理データのうち、前記所定の処理時刻を第 2 の処理時刻とする管理データを特定し、

直前に特定した管理データの第 1 の処理時刻を取得して、当該管理データの工程名が示す工程の前工程を示す工程名を含むとともに取得した第 1 の処理時刻を第 2 の処理時刻として含む管理データを新たに特定する処理を、前記原因工程を示す工程名を含む管理データを特定するまで繰り返すことを特徴とする請求項 2 又は 3 記載の工程管理システム。

【請求項 5】前記制御手段は、前記原因工程を示す工程名を含む管理データを特定し、直前に特定した管理データの工程名が示す工程の次工程を示す工程名を含むとともに前記管理データの前記第 2 の処理時刻を第 1 の処理時刻として含む管理データを新たに特定する処理を、繰り返し、最終的に特定された管理データに含まれるローカル識別子を取得することを特徴とする請求項 4 記載の工程管理システム。

【請求項 6】前記各計時手段は、対応する工程における処理の開始時刻を処理時刻として取得することを特徴と

する請求項 1～5 のいずれかに記載の工程管理システム。

【請求項 7】前記各計時手段は、対応する工程における処理の終了時刻を処理時刻として取得することを特徴とする請求項 1～5 のいずれかに記載の工程管理システム。

【請求項 8】前記各計時手段は、対応する工程における処理の開始時刻及び終了時刻を処理時刻として取得することを特徴とする請求項 1～5 のいずれかに記載の工程管理システム。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、互いに接続された複数の工程からなる作業における各工程を管理する工程管理システムに、関する。

【0002】

【従来の技術】一般に、各種生産設備によって製造される製品は、複数の部品により構成されている。これら各部品は、遊れば、他の生産設備において、製品として製造されたものである。ここで、部品を受け入れて製品を製造する機能的単位を、工程と呼ぶならば、これら各工程が所定の順序で接続されることにより、はじめて最終的な製品が得られるわけである。

【0003】従って、万一ある工程において製造された製品の中に、不良品が発生していたことが発見された場合、当該工程に不良発生の原因がある場合もあるし、当該工程に部品を供給した上流側の各工程のいずれかが、不良品の発生に関係している場合もある。

【0004】いま、仮に、ある工程において製造された製品の中に、不良品が発生していたことが発見され、さらに、上流側のある工程において製造された部品が、この不良品の発生の原因であったと確認されたとする。このような場合、各工程の各段階に、問題となった部品が存在する可能性がある。従って、作業者は、製品の製造を中断し、不良の発生に関係する疑いのある各工程において、これら各工程の各段階に存在している部品や製品を、全て除去したり、検査し直したりしなければならない。

【0005】

【発明が解決しようとする課題】上記の従来技術によると、不良品が発見された場合、各工程内及び各工程間から当該不良品を除去するために、多大な時間と労力がかかるという、問題があった。

【0006】通常、不良の原因は、ある工程においてある限られた時間のみ存在する。このため、不良品が製造されてしまった場合、当該工程において同時に製造された同一 LOT の各部品のみが、高い確率で不良品となっているのである。従って、当該 LOT の部品のみが全て除去されることが望ましい。しかしながら、この LOT の部品は、後続の多くの工程において、部品として在

庫されていたり、既に製品として組み込まれていたたりするので、作業者は、各工程における部品及び製品から、当該LOTに係るものを全て特定することは、事実上不可能である。

【0007】もちろん、同一LOTとして製造された全ての部品に対して、作業者が、当該LOTを示す刻印を施すことにより、各工程内及び各工程間の部品の流れを管理することもできる。しかし、刻印機のイニシャルコスト、及びその運用に係るコストを考えると、最終的に製造される製品が、高価なものになってしまう。

【0008】そこで、高価な機器を用いずに簡便に工程を管理し、不良品を確実に追跡可能な工程管理システムを提供することを、本発明の課題とする。

【0009】

【課題を解決するための手段】本発明では、上記課題を解決するために、以下のような構成を採用した。

【0010】即ち、本発明の工程管理システムは、前工程から出力物として出力された物品を入力物として夫々処理するとともに処理により得られた物品を次工程へ出力物として出力する各工程を管理する工程管理システムであって、前記各工程における入力物に対する処理時刻を取得する複数の計時手段と、前記各計時手段に夫々接続され、各工程を一意的に示す工程名、該工程名が示す工程における処理時刻である第1の処理時刻、及び、当該工程からの出力物に対する次工程における処理時刻である第2の処理時刻を、一組の管理データとして記憶する記憶手段とを、備えることを特徴とする。

【0011】なお、前記物品は、複数まとめられた状態で、出力物として出力されるとともに次工程において入力物として受け入れられ、この次工程において、任意の数量抽出されて処理されることとしてもよい。そして、前記管理データは、複数まとめられた状態の前記物品に対応し、相隣接する各工程間において一意的に自他識別可能であるとともに相隣接する各工程間を移動する前記物品に対応させたローカル識別子を、さらに有することとしてもよい。さらに、複数の物品は、箱その他の格納体内に格納された状態で取り扱われてもよい。また、この箱には、箱記号、即ち、バーコード、符号、又はイメージ等の自他識別可能なローカル識別子が、付されていてもよい。

【0012】また、前記工程管理システムの制御手段は、所定の工程において所定の処理時刻に処理された出力物が指定されるとともに当該工程を遡った上流側の原因工程が指定された場合、前記所定の工程の前工程を示す工程名を有する管理データのうち、前記所定の処理時刻を第2の処理時刻とする管理データを特定し、直前に特定した管理データの第1の処理時刻を取得して、当該管理データの工程名が示す工程の前工程を示す工程名を含むとともに取得した第1の処理時刻を第2の処理時刻として含む管理データを新たに特定する処理を、前記原

因工程を示す工程名を含む管理データを特定するまで繰り返すこととしてもよい。

【0013】さらに、この制御手段は、前記原因工程を示す工程名を含む管理データを特定し、直前に特定した管理データの工程名が示す工程の次工程を示す工程名を含むとともに前記管理データの前記第2の処理時刻を第1の処理時刻として含む管理データを新たに特定する処理を、繰り返し、最終的に特定された管理データに含まれるローカル識別子を取得することとしてもよい。

10 【0014】例えば、ある工程の出力物が不良品であり、この不良の原因が上流の工程（原因工程）から出力された出力物にある場合、工程管理システムの制御手段は、原因となった出力物の全てを追跡することができ

る。

【0015】なお、上記各工程は、前工程から搬出された製品（出力物）を、部品（入力物）として搬入し、この部品を使用して製品を製造し、得られた製品を次工程へ搬出する製造工程であってもよい。そして、ある工程において同時期に製造された製品は、同一LOTとしてまとめられた状態で、取り扱われることとしてもよい。また、各工程において、複数まとめられた状態で搬入された製品は、任意の数量に分割されたうえで、複数回に分けて使用されてもよい。また、上記各工程は、物品を輸送してゆく物流上の工程や、商品販売上の工程であってもよい。

【0016】なお、処理時刻は、処理が開始された時刻であってもよく、処理が終了した時刻であってもよく、処理が開始された時刻及び終了した時刻の双方であってもよい。また、各工程における計時手段は、各工程における生産施設と連動して自動計時可能であってもよく、作業者の指示に基づいて計時を行うこととしてもよい。

【0017】

【発明の実施の形態】以下、図面に基づいて、本発明の一実施形態について説明する。本実施形態による工程管理システムは、例えば、複数の工程からなる生産工程群全体を管理するためのものである。まず、この「工程」について説明する。ここでの工程とは、生産における所定の処理単位であり、受け入れた部品を使用して製品を製造する機能を有する。即ち、工程とは、工場等の生産施設内における所定の領域に設置された工作機械等の各種生産設備、及び部品や製品を格納しておく各種倉庫、並びに、これら生産設備や倉庫を利用して生産活動を行う作業により実現される機能的単位のことである。

【0018】また、これらの各工程は、所定の順序で接続されている。そして、各工程は、前工程から搬出された部品を使用して製品を製造し、得られた製品を次工程へ搬出する。なお、部品／製品は、LOT単位で取り扱われる。即ち、部品／製品は、箱（格納体）の中に例えば50個や300個というまとまった数量格納された状態で、取り扱われることになる。また、各箱には、当該

の箱を他の箱から区別するためのユニークな箱記号（ローカル識別子）が付与されている。より具体的には、各箱の表面に、その箱の箱記号を示すバーコードが貼付されているのである。

【0019】上記の各工程における各種倉庫は、部品入庫倉庫、部品使用倉庫、製品完成倉庫、及び製品搬出倉庫からなる。以下、図1を参照して、工程内における各倉庫間の部品／製品の移動について説明する。

【0020】まず、ある工程に、部品が格納された箱が到着すると、作業者は、この箱を部品入庫倉庫内に格納して保管しておく。そして、製造が開始される際、作業者は、部品入庫倉庫内に格納された箱のうち必要なものを選択して、部品使用倉庫へ移す。そのうえで、作業者は、この部品使用倉庫に移された箱の中の部品を使用して、製品を製造する。なお、完成した製品は、部品が格納された箱とは別の箱の中に、順次格納されてゆく。製造が終了すると、作業者は、製品が格納された箱を製品完成倉庫内へ格納して保管しておく。そして、製品出荷の際、作業者は、製品完成倉庫内に格納された箱のうち必要なものを選択して、製品搬出倉庫へ移す。なお、製品搬出倉庫に移された箱は、直ちに次工程へ向けて搬出される。

【0021】このような各工程が所定の順序で接続されることにより、目的となる最終製品が生産されるのである。図2は、各工程間の接続関係を示す模式図である。なお、この図2には、複数の工程のうちの6つの工程、即ち、A工程、B工程、C工程、D工程、E工程、及びF工程が、模式的に示されている。

【0022】この図2において、C工程は、A工程において完成した製品（出力物）を、当該C工程における部品（入力物）として受け入れるとともに、B工程において完成した製品（出力物）を、当該C工程における部品（入力物）として受け入れる。さらに、C工程は、受け入れた部品に対して組立及び加工等の処理を施して当該C工程における製品として完成させ、この製品を出力物として、F工程へ送る。

【0023】そして、F工程は、C工程による製品を部品として受け入れるとともに、D工程による製品を部品として受け入れ、かつ、E工程による製品を部品として受け入れる。さらに、F工程は、受け入れた部品により製品を完成させる。なお、このF工程による製品は、生産工程群全体の最終製品ともなっている。

【0024】次に、上述の生産工程群における各工程を管理するための、工程管理システムの構成について説明する。図3は、本実施形態による工程管理システムを示す構成図である。この工程管理システムは、サーバ1、ネットワークを介して該サーバ1に夫々接続された複数のパーソナルコンピュータ（以下PCと略記）2、及び各PC2に夫々接続された複数の端末3A～3Fを、有する。なお、各端末3A、3B、3C、3D、3E、3

Fは、各工程、即ち、A工程、B工程、C工程、D工程、E工程、F工程に、夫々対応させて配置されている。

【0025】図4は、サーバ1を示す構成図である。この図4に示されるように、サーバ1は、バスによって相互に接続されたCPU11、RAM12、HDD13、通信制御回路14、表示制御回路15、及び入力制御回路16を、有する。さらに、サーバ1は、表示制御回路15に接続されたCRT17、及び入力制御回路16に接続されたキーボード18を、有する。また、サーバ1は、その通信制御回路14によって、ネットワークに接続されている。

【0026】HDD13には、オペレーティングシステム、及びデータベース・プログラム等の各種プログラムが予め記憶されている。また、このHDD13には、図2に示される各工程間の接続関係を示すテーブルが予め記憶されている。

【0027】CPU11は、このHDD13に格納されたプログラムを読み出し、RAM12の所定領域に展開させたうえで実行させる。そして、CPU11は、表示制御回路15を制御してCRT17に画像を画面表示させることにより、作業員に対して必要な情報を伝達させることができる。そして、作業員がキーボード18に対して入力操作を行うと、CPU11は、入力制御回路16を介して当該入力操作を検知することができる。後において説明するが、製造された製品に不良が発生した場合、作業員は、サーバ1に対し、不良品追跡を指示することができる。

【0028】なお、各PC2も、上記サーバ1と略同一の構成であり、ネットワークを介してこのサーバ1に夫々接続されている。そして、各PC2には、複数の端末3A～3Fが、ネットワークを介して夫々接続されている。図5は、端末3Aの構成を示す説明図である。なお、他の各端末3B～3Fも、夫々、この端末3Aと同一の構成になっている。この図5に示されるように、端末3Aは、プログラマブル・ロジック・コントローラ（以下PLCと記す）31、表示入力装置32、及びバーコードリーダ33を、有する。

【0029】PLC31は、バスによって相互に接続されたCPU311、ROM312、RAM313、通信制御回路314、入力制御回路315、及び表示制御回路316を、有する。また、CPU311は、計時手段としての時計Mを内蔵しており、この時計Mによって、時刻（年、月、日、時、分、秒）を取得することができる。ROM312内には、データベース・プログラム等の各種プログラムが予め記憶されている。RAM313は、ROM312に記憶されたプログラムを実行させるための領域、及び、後述する各仮想倉庫として使用される領域を、有する。

【0030】なお、図5には、これら各仮想倉庫、即

ち、部品入庫仮想倉庫、部品使用仮想倉庫、製品完成仮想倉庫、及び、製品搬出仮想倉庫が、模式的に示されている。後において説明するが、各仮想倉庫、即ち、部品入庫仮想倉庫（搬入仮想倉庫部）、部品使用仮想倉庫（使用仮想倉庫部）、製品完成仮想倉庫（完成仮想倉庫部）、及び、製品搬出仮想倉庫（搬出仮想倉庫部）は、実際の工程内における各倉庫、即ち、図1に示された部品入庫倉庫、部品使用倉庫、製品完成倉庫、及び製品搬出倉庫に夫々対応させて、RAM313上に設けられている。

【0031】表示入力装置32は、タッチパネル321、及び液晶パネル（以下LCDと記す）322を、有する。タッチパネル321は、LCD322の画面上に配置されるとともに、PLC31の入力制御回路315に接続されている。また、LCD322は、PLC31の表示制御回路316に接続されている。読取手段としてのバーコードリーダ33は、PLC31の入力制御回路315に接続されるとともに、バーコードを読み取ることができる。即ち、このバーコードリーダ33は、部品／製品を格納した箱に付されたローカル識別子としてのバーコードを読み取らせるために、使用される。

【0032】そして、PLC31のCPU311は、ROM312内に格納されたプログラムをRAM313の所定領域に展開させて、実行する。また、PLC31のCPU311は、表示制御回路316を制御して表示入力装置32のLCD322に画像を表示させる。この画像内には、複数のボタン、即ち、搬入ボタン、使用ボタン、製造開始ボタン、製造終了ボタン、及び、搬出ボタンが、含まれている。

【0033】作業者は、LCD322に表示された各ボタンを押すことにより、入力操作を行うことができる。即ち、LCD322の画面上に配置されたタッチパネル321は、作業者によって押された画面上の位置を検出可能であり、この位置を示す信号を、PLC31の入力制御回路315へ送信することができる。そして、CPU311は、この入力制御回路315を介して、作業者によって押された画面上の位置を検知するとともに、この位置が画面上のどのボタンに重なっているのかを認識できるのである。

【0034】また、作業者がバーコードリーダ33によってバーコードを読み取らせた場合、このバーコードリーダ33は、当該バーコードに対応したバーコードデータを取得してPLC31の入力制御回路315へ送信する。PLC31のCPU311は、この入力制御回路315を介してバーコードデータを取得可能である。

【0035】このように構成された各端末3A～3Fは、その通信制御回路314を介してネットワークに接続されている。

【0036】なお、サーバ1のCPU11、及び端末3A～3FのCPU311は、制御手段に相当する。ま

た、サーバ1のRAM12及びHDD13、並びに端末3A～3FのRAM313は、記憶手段に相当する。

【0037】次に、実際の各工程における部品／製品の流れと、工程管理システム内のデータ処理の流れとの対応関係について説明する。なお、上記のように、部品／製品は、ある数量まとめられた状態で（箱の中に格納されて）取り扱われる。

【0038】工程管理システムは、このようにある数量まとめられた状態の部品／製品毎に、1単位の管理データを対応させている。なお、各管理データは、サーバ1におけるデータベース・プログラム、及び、各端末3A～3Fにおけるデータベース・プログラムにより、処理される。また、後において説明するが、各管理データは、「搬出時刻」、「搬入時刻」、「工程名」、「箱記号」、「製造時刻」、及び「使用時刻」の各フィールドを、有する。そして、各工程内及び各工程間において、物品（部品／製品）が移動してゆくと、この物品（部品／製品）の流れに一致した状態で、対応する管理データが工程管理システム内において更新されてゆく。

【0039】例えば、図2におけるC工程に着目すると、上述の如く、このC工程では、A工程から出荷された製品を当該C工程における部品として受け入れるとともに、B工程から出荷された製品を当該C工程における部品として受け入れる。ここで、A工程において製造された製品は、所定の箱記号（a1, a2, a3, …）が付された箱に格納された状態で、C工程へと搬出される。なお、箱記号「a1」が付された箱のことを、以下、「箱a1」と表記することとする（他の箱記号が付された箱についても同様に表記する）。

【0040】このA工程からの製品搬出時に、端末3Aは、対応する管理データをサーバ1及び端末3Cへ送信する。図6は、この管理データを模式的に示している。なお、この管理データは、処理が進むにつれて、その内容が順次更新されてくものである。そして、A工程から箱a1が搬出された時点における管理データの状態を示すのが、図6の（I）である。

【0041】ここで、この図6の（I）を例にとりて、管理データ中の各フィールドについて説明する。工程名フィールドは、当該管理データに対応する製品が製造された工程名を格納するためのフィールドである。図6の（I）では、工程名フィールドにA工程を示す「A」が格納されている。

【0042】搬出時刻フィールドは、工程名フィールド内に格納された工程名が示す工程（この場合A工程）から製品が搬出された時刻（搬出時刻）を格納するためのフィールドである。図6の（I）では、搬出時刻フィールドに「T11」が格納されている。

【0043】搬入時刻フィールドは、このように搬出された製品が、当該工程の次の工程（この場合C工程）において、部品として搬入された時刻（搬入情報としての

搬入時刻)を格納するためのフィールドである。なお、図6の(I)は、A工程からの搬出が行われたばかりで、まだ、次のC工程における搬入がなされていない時点の管理データを示しているの、この搬入時刻フィールドは空欄となっている。

【0044】箱記号フィールドは、完成した製品が収容された箱の箱記号を格納しておくためのフィールドである。図6の(I)では、箱記号フィールドに「a1」が格納されている。

【0045】製造時刻フィールドは、製品の製造が開始された時刻(製造時刻)を格納しておくためのフィールドである。この製造時刻は、第1の処理時刻に相当する。図6の(I)では、製造時刻フィールドに「T10」が格納されている。

【0046】使用時刻フィールドは、製品が製造された工程の次工程(この場合C工程)において、この製品が部品として使用されて製造が行われる際に、この製造が開始される時刻(部品として使用されるため使用時刻という)を格納するためのフィールドである。この使用時刻は、第2の処理時刻に相当する。なお、図6の(I)では、A工程による製品が、まだ次のC工程において部品として使用されていないので、この使用時刻フィールドは空欄になっている。

【0047】このような構成の管理データ(図6の(I))が、端末3Aから送信されると、サーバ1は、この管理データを受信して保持する。また、端末3Cは、この管理データを受信して、その部品入庫仮想倉庫内に格納する。なお、この時点において、対応する現物(A工程における製品、即ちC工程における部品)は、まだ、C工程に到着していない。このことは、当該管理データの搬入時刻フィールドが空欄になっていることにより、確認される。

【0048】やがて、C工程に、箱a1が到着すると、作業者は、端末3Cに対して、その表示入力装置32の搬入ボタンを押下することにより、搬入処理を指示するとともに、そのバーコードリーダ33によって箱a1のバーコードを読み取らせる。すると、端末3Cは、箱記号「a1」を示すバーコードデータを取得するとともに、その時計Mによって時刻「T16」を、搬入時刻として取得する。そして、端末3Cは、その部品入庫仮想倉庫内に格納された管理データのうち、その箱記号フィールドに「a1」が格納された管理データを検索して特定する。そのうえで、端末3Cは、特定された管理データの搬入時刻フィールドに、搬入時刻「T16」を格納する。このように更新された管理データを、図6の(II)に示す。

【0049】同時に、端末3Cは、箱記号「a1」及び搬入時刻「T16」を、搬入信号としてセットし、この搬入信号をサーバ1、及び端末3Aへ送信する。サーバ1は、この搬入信号を受信して、その箱記号「a1」及

び搬入時刻「T16」を取得する。そして、サーバ1は、保持している管理データのうち、その搬入時刻フィールドが空欄であり、かつ、その箱記号フィールドに「a1」が格納された管理データを、検索して特定する。そのうえで、サーバ1は、特定された管理データの搬入時刻フィールドに搬入時刻「T16」を格納する。一方、端末3Aも、搬入信号を受信して、同様に該当する管理データを更新する。

【0050】なお、このようにC工程に搬入された箱a1は、端末3Cのバーコードリーダ33による読取処理後、部品入庫倉庫内に保管される。また、この箱a1内の物品、即ちA工程における製品は、C工程においては部品として取り扱われることになる。

【0051】上記のように、A工程からC工程への物品の流れに対応して、工程管理システム内の管理データが更新されてゆくのである。同様に、B工程からC工程への物品の流れに対応して、工程管理システム内の管理データが更新されてゆく。図7は、この管理データを模式的に示している。即ち、B工程において製造された製品が、箱b1に格納された状態でC工程へ向けて搬出された場合、端末3B内における対応する管理データが、サーバ1及び端末3Cへ向けて送信される。この管理データは、図7の(I)に示されるように、その搬入時刻フィールド及び使用時刻フィールドが、いずれも空欄である。サーバ1は、端末3Bから送信された管理データ(図7の(I))を受信して保持する。また、端末3Cは、この管理データを受信して、その部品入庫仮想倉庫内に格納する。

【0052】やがて、C工程に、箱b1が到着すると、作業者は、端末3Cに対して、その表示入力装置32の搬入ボタンを押下することにより、搬入処理を指示するとともに、そのバーコードリーダ33によって箱b1のバーコードを読み取らせる。すると、端末3Cは、箱記号「b1」を示すバーコードデータを取得するとともに、その時計Mによって時刻「T17」を、搬入時刻として取得する。そして、端末3Cは、その部品入庫仮想倉庫内に格納された管理データのうち、その箱記号フィールドに「b1」が格納された管理データを特定する。そのうえで、端末3Cは、特定された管理データの搬入時刻フィールドに、搬入時刻「T17」を格納する。このように更新された管理データを、図7の(II)に示す。

【0053】同時に、端末3Cは、箱記号「b1」及び搬入時刻「T17」を、搬入信号としてセットし、この搬入信号をサーバ1、及び端末3Bへ送信する。サーバ1は、搬入信号を受信して、その箱記号「b1」及び搬入時刻「T17」を取得する。そして、サーバ1は、保持している管理データのうち、その搬入時刻フィールドが空欄であり、かつ、その箱記号フィールドに「b1」が格納された管理データを、特定する。そのうえで、サ

サーバ1は、特定された管理データの搬入時刻フィールドに搬入時刻「T17」を格納する。一方、端末3Bも、搬入信号を受信して、同様に該当する管理データを更新する。

【0054】なお、このようにC工程に搬入された箱b1は、端末3Cのバーコードリーダ33による読取処理後、部品入庫倉庫内に保管される。また、この箱b1内の物品、即ちB工程における製品は、C工程においては部品として取り扱われることになる。

【0055】そして、C工程では、上記の如く搬入されたA工程からの部品、及びB工程からの部品により、当該C工程における製品が製造される。即ち、A工程からの部品は、箱a1に格納された状態でC工程の部品入庫倉庫に搬入されている。また、B工程からの部品は、箱b1に格納された状態でC工程の部品入庫倉庫に搬入されている。なお、製造が開始されるまで、これらの部品は、部品入庫倉庫内に保管されている。

【0056】そして、作業者は、製造を開始する際に、部品入庫倉庫内に格納された箱a1及び箱b1を、部品使用倉庫へ移動させる。同時に、作業者は、端末3Cに対して、その表示入力装置32の使用ボタンを押下することにより、部品使用処理を指示する。すると、端末3Cは、部品使用仮想倉庫内に格納された全ての管理データを、その表示操作装置32に表示する。作業者は、表示された管理データの中から、図6の(II)に示された管理データ、及び、図7の(II)に示された管理データを選択する。すると、端末3Cは、選択された両管理データを、その部品入庫仮想倉庫から、部品使用仮想倉庫へと移動させる。

【0057】さらに、作業者は、端末3Cに対して、その表示入力装置32の製造開始ボタンを押下することにより、製造開始を通知する。すると、端末3Cは、その時計Mにより、製造開始の時刻「T18」を取得する。そして、端末3Cは、部品使用仮想倉庫内の管理データのうち、その使用時刻フィールドが空欄になった管理データを特定する。そのうえで、端末3Cは、特定された管理データの使用時刻フィールドに、「T18」を格納する。

【0058】また、端末3Cは、箱記号「a1」及び時刻「T18」を使用信号としてセットして、サーバ1及び端末3Aへ送信する。同時に、端末3Cは、箱記号「b1」及び時刻「T18」を使用信号としてセットして、サーバ1及び端末3Bへ送信する。即ち、端末3Cからは2つの使用信号が送信される。すると、サーバ1は、両使用信号を受信するが、端末3Aは一方の使用信号のみを受信し、端末3Bは他方の使用信号のみを受信することになる。

【0059】そして、サーバ1は、一方の使用信号に基づき、その箱記号「a1」及び使用時刻「T18」を取得する。そして、サーバ1は、保持している管理データ

のうち、その使用時刻フィールドが空欄であり、かつ、その箱記号フィールドに「a1」が格納された管理データを、検索して特定する。そのうえで、サーバ1は、特定された管理データの使用時刻フィールドに使用時刻「T18」を格納する。また、端末3Aも、この使用信号に基づき、同様に該当する管理データを更新する。このように更新された管理データを、図6の(III)に示す。

【0060】さらに、サーバ1は、他方の使用信号に基づき、その箱記号「b1」及び使用時刻「T18」を取得する。そして、サーバ1は、保持している管理データのうち、その使用時刻フィールドが空欄であり、かつ、その箱記号フィールドに「b1」が格納された管理データを、検索して特定する。そのうえで、サーバ1は、特定された管理データの使用時刻フィールドに使用時刻「T18」を格納する。また、端末3Bも、この使用信号に基づき、同様に該当する管理データを更新する。このように更新された管理データを、図7の(III)に示す。

【0061】なお、A工程、及びB工程において製造された製品が、部品としてC工程へ供給されて当該C工程における製造に“使用”されるわけである。このため、C工程における製品の製造時刻「T18」は、当該C工程へ部品を供給したA工程、及びB工程にとっては使用時刻に相当するのである。

【0062】そして、作業者は、当該C工程における製品を格納するための箱c1を用意し、そのバーコードを、端末3Cのバーコードリーダ33により読み取らせる。すると、端末3Cは、取得されたバーコードデータ33から、箱記号「c1」を取得することになる。そのうえで、作業者は、箱a1内に格納された部品、及び箱b1内に格納された部品を使用して、製品を製造してゆく。なお、製造の結果完成した製品は、箱記号「c1」の箱の中に格納されてゆく。

【0063】製造が終了すると、作業者は、箱c1内に所定数量格納された状態の製品を、製品完成倉庫へ移す。同時に、作業者は、端末3Cに対して、その表示入力装置32の製造終了ボタンを押下することにより、製造終了を通知する。すると、端末3Cは、箱c1内に格納された製品に対応させた管理データを作成して、製品完成仮想倉庫内に格納する。図8の(I)は、この状態の管理データを示している。該管理データは、その搬出時刻フィールド、搬入時刻フィールド、及び使用時刻フィールドが、空欄になっている。また、工程名フィールドには、C工程を示す「C」が格納され、箱記号フィールドには「c1」が格納され、かつ、製造時刻フィールドには、製造開始の時刻である「T18」が格納されている。

【0064】このように製造された製品は、次工程へ搬出されるまでの間、製品完成倉庫内に格納されている。

そして、この製品に対応した管理データも、製品完成仮想倉庫内に格納されたままになっている。

【0065】なお、図6の(III)に示される管理データ、及び図7の(III)に示される管理データは、その使用時刻フィールドに「T18」が夫々格納されている。これは、両管理データに対応する部品が、C工程において同時に使用されたためである。しかし、例えば、箱a1内の部品数量が40であって、箱b1内の部品数量が100であったとする。いま、C工程において、両部品を1つずつ使用することにより1つの製品が製造されるとするならば、箱a1内の部品、及び箱b1内の部品を使用して製造可能な製品の数量は、40個に限定されてしまう。従って、箱b1内の部品のうち使用されずに残った60個は、次回の製造に使用されることになる。

【0066】そして、次回の製造が、時刻「T22」に開始されたとするならば、図7の(III)に示された管理データは、その使用時刻フィールドに、さらに「T22」が追加されて、図7の(IV)に示される状態に更新されることになる。このように、使用時刻フィールドは、複数の使用時刻を保持することができるのである。

【0067】上記のように、製造が完了して製品完成倉庫内に保存された製品を搬送する場合、作業者は、この製品完成倉庫内に格納された製品を製品搬出倉庫へ移動させる。なお、この製品搬出倉庫に移された製品は、すぐに出荷されることになる。

【0068】同時に、作業者は、端末3Cに対して、その表示入力装置32の搬出ボタンを押下することにより、製品の搬出処理を指示する。すると、端末3Cは、製品完成仮想倉庫内の各管理データを、表示操作装置32に表示させる。作業者は、端末3Cに対し、その表示入力装置32を操作して図8の(I)に示された管理データを選択する。すると、端末3Cは、その時計Mによって時刻(搬出時刻)「T19」を取得し、選択された管理データの搬出時刻フィールドにT19を格納する。そのうえで、端末3Cは、この選択された管理データを、製品完成仮想倉庫から製品搬出仮想倉庫へ移動させる。製品搬出仮想倉庫に移された管理データを、図8の(II)に示す。

【0069】さらに、端末3Cは、この管理データ(図8の(II))を、コピーしてサーバ1及び端末3Fへ送信する。サーバ1は、この管理データを受信して保持する。また、端末3Fは、この管理データを受信して、その部品入庫仮想倉庫内に格納する。

【0070】このように、工程管理システム内の各管理データは、各工程内及び各工程間における各物品(部品/製品)の流れに対応していることがわかる。

【0071】以下、本実施形態の作用について、説明する。まず、各工程間における部品/製品の流れの一例を、図9を参照して説明する。この図9には、各工程に

おける製造、搬出、及び搬入の夫々の処理に対応させて、当該処理の時刻T10~T29が示されている。以下、この時刻T10~T29の時系列順に、説明する。

【0072】T10: A工程において、〈40〉個の製品が製造され、箱a1に格納される。

【0073】T11: A工程から、箱a1が搬出される。なお、この箱a1内には、A工程において製造された製品[40]個が格納されている。

【0074】T12: B工程において、〈100〉個の製品が製造され、箱b1に格納される。

【0075】T13: B工程から、箱b1が搬出される。なお、この箱b1内には、B工程において製造された製品[100]個が格納されている。

【0076】T14: A工程において、〈60〉個の製品が製造され、箱a2に格納される。

【0077】T15: A工程から、箱a2が搬出される。なお、この箱a2内には、A工程において製造された製品[60]個が格納されている。

【0078】T16: A工程から搬送された箱a1が、C工程に搬入される。なお、この箱a1内には、A工程において製造された製品40個が格納されている。これらの製品は、C工程において(40)個の部品として受け入れられる。

【0079】T17: B工程から搬送された箱b1が、C工程に搬入される。なお、この箱b1内には、B工程において製造された製品100個が格納されている。これらの製品は、C工程において(100)個の部品として受け入れられる。

【0080】T18: C工程において、箱a1内の部品40個の全て、及び箱b1内の部品100個のうちの40個が使用され、〈40〉個の製品が製造される。なお、製造された製品は、箱c1に格納される。

【0081】T19: C工程から、箱c1が搬出される。なお、この箱c1内には、C工程において製造された製品[40]個が格納されている。

【0082】T20: D工程から、箱d1が搬出される。なお、この箱d1内には、D工程において製造された製品[100]個が格納されている。

【0083】T21: A工程から搬送された箱a2が、C工程に搬入される。なお、この箱a2内には、A工程において製造された製品60個が格納されている。これらの製品は、C工程において(60)個の部品として受け入れられる。

【0084】T22: C工程において、箱a2内の部品60個の全て、及び箱b1内に残された部品60個の全てが使用され、〈60〉個の製品が製造される。なお、製造された製品は、箱c2に格納される。

【0085】T23: C工程から、箱c2が搬出される。なお、この箱c2内には、C工程において製造された製品[60]個が格納されている。

【0086】T24: C工程から搬送された箱c1が、F工程に搬入される。なお、この箱c1内には、C工程において製造された製品40個が格納されている。これらの製品は、F工程において(40)個の部品として受け入れられる。

【0087】T25: E工程から、箱e1が搬出される。なお、この箱e1内には、E工程において製造された製品[100]個が格納されている。

【0088】T26: D工程から搬送された箱d1が、F工程に搬入される。なお、この箱d1内には、D工程において製造された製品100個が格納されている。これらの製品は、F工程において(100)個の部品として受け入れられる。

【0089】T27: C工程から搬送された箱c2が、F工程に搬入される。なお、この箱c2内には、C工程において製造された製品60個が格納されている。これらの製品は、F工程において(60)個の部品として受け入れられる。

【0090】T28: E工程から搬送された箱e1が、F工程に搬入される。なお、この箱e1内には、E工程において製造された製品100個が格納されている。これらの製品は、F工程において(100)個の部品として受け入れられる。

【0091】T29: C工程において、箱c1内の部品40個の全て、箱d1内の部品100個のうちの40個、及び、箱e1内の部品100個のうちの40個が使用され、<40>個の製品が製造される。なお、製造された製品は、箱f1に格納される。

【0092】このように、各工程内及び各工程間において各物品(部品/製品)が移動してゆくと、工程管理システム内の各管理データは、これら各物品(部品/製品)の流れに対応して更新されてゆく。従って、作業者は、各管理データを調べることにより、対応する物品(部品/製品)がどこにどのような状態で存在するのかわかることができる。

【0093】特に、作業者は、端末3A(各端末3B～3Fも同様)の製品搬出仮想倉庫内の管理データ調べることにより、搬出された製品の状態を認識することができる。即ち、管理データの搬入時刻フィールドが空欄であれば、作業者は、当該管理データに対応する製品が、まだ次工程に到着していないということを、認識することができる。また、管理データの搬入時刻フィールドに時刻が格納されていれば、作業者は、この時刻に、当該管理データに対応する製品が次工程において搬入されたということを、認識することができる。

【0094】さらに、作業者は、端末3A(各端末3B～3Fも同様)の部品入庫仮想倉庫内の管理データ調べることにより、前工程から搬出された部品の状態を認識することができる。即ち、管理データの搬入時刻フィールドが空欄であれば、作業者は、当該管理データに対応

する部品が、まだ到着していないということを、認識することができる。この場合、作業者は、当該管理データの搬出時刻フィールドに格納された時刻に、対応する部品が前工程から搬出されたということを、認識することができる。また、管理データの搬入時刻フィールドに時刻が格納されていれば、作業者は、対応する部品が既に当該工程の部品入庫倉庫内に在庫されているということを認識することができる。

【0095】また、上記のように製造が行われた結果、サーバ1のHDD13内には、図10に示す各管理データが格納されることになる。これら各管理データには、各工程内及び各工程間における当該管理データに対応する物品の処理の履歴が記録されている。従って、仮に、ある工程において不良品が発見された場合、サーバ1は、これら各管理データに基づいて、不良品の追跡を行うことができる。以下、この不良品追跡処理について、図11及び図12のフローチャートを参照して説明する。

【0096】例えば、ある工程における製品の製造中に、作業者が、現在製造中の製品に不良が発生していることを発見したとする。さらに、作業者は、この不良の原因が現在製造中の工程にあるのではなく、上流側の他の工程において製造された製品が、後続の工程において順次部品として使用されたために発生したということを確認したとする。ここで、作業者は、例えば最寄のPC2を用いてサーバ1にアクセスし、このサーバ1に対して不良品追跡を指示する。なお、この時、作業者は、不良品が発見された工程を示す工程名、及び不良発生の原因となった上流側の工程を示す工程名を、PC2を用いてサーバ1に対して通知する。

【0097】サーバ1のCPU11は、作業者による指示を受けて、図11のフローチャートに示される処理を開始させる。以下、この図11の各ステップ毎に説明する。

【0098】S001では、サーバ1のCPU11は、作業者によってPC2から送られた通知内容、即ち、不良品が発見された工程を示す工程名、及び、不良の原因となった工程を示す工程名を取得する。

【0099】次のS002では、CPU11は、ネットワークを介して、不良品が発見された工程に配置された端末3(A～F)から、当該工程において現在製造中の製品に関する製造時刻を取得する。

【0100】次のS003では、CPU11は、各工程間の関係を示すテーブルを参照し、不良品が発見された工程と、不良品発生の原因となった上流側の工程との接続関係を認識する。

【0101】次のS004では、CPU11は、S002において端末3(A～F)から取得した製造時刻を基に、この時刻を使用時刻とした管理データであって、不良品が発見された工程よりも1段階だけ上流側の工程に

関する管理データを、自己のサーバ1のHDD13内から一つ特定する。

【0102】次のS005では、CPU11は、特定された管理データの工程名が、不良品発生の原因となった工程を示すか否かをチェックする。そして、工程名が不良品発生の原因となった工程名を示す場合、CPU11は、処理をS009へ進める。しかし、当該管理データの工程名が不良品発生の原因となった工程を示していない場合、CPU11は、S006乃至S008のループ処理を実行する。

【0103】このループ処理に入って最初のS006では、CPU11は、S004によって特定された管理データ（ループ処理が初めての場合）もしくは前回のループ処理で実行したS007によって特定された管理データ（ループ処理が2回目以降である場合）の製造時刻を取得する。

【0104】次のS007では、CPU11は、S004によって特定された管理データもしくは前回のループ処理におけるこのS007によって特定された管理データの工程名が示す工程よりも1段階だけ上流の工程に関する管理データであって、S006によって取得された製造時刻を使用時刻とした管理データを、自己のHDD13内から一つ特定する。

【0105】次のS008では、CPU11は、S007にて特定された管理データの工程名が、不良品発生の原因となった工程を示すか否かをチェックする。そして、この工程名が不良品発生の原因となった工程を示していない場合、CPU11は、処理をS006に戻す。

【0106】以上のS006乃至S008のループを繰り返した結果、S008で、管理データの工程名が、不良品発生の原因となった工程を示していると判断した場合には、CPU11は、処理をS008からS009へ進める。

【0107】一方、S009では、CPU11は、S004又はS007にて特定された管理データの使用時刻を取得する。なお、この使用時刻は、1つのみ付与されている場合もあるが、複数付与されている場合もある。そこで、CPU11は、取得された各使用時刻を、夫々検索用のキーとして指定する。

【0108】次のS010では、CPU11は、指定された各使用時刻毎に、夫々不良品追跡処理を進める。そして、CPU11は、各使用時刻毎に追跡結果を取得して作業員に対して通知し、処理を終了させる。

【0109】以下、この図11のS010において実行される不良品追跡処理サブルーチンについて、さらに詳述する。図12は、指定された各使用時刻のうちのある1つの使用時刻に関する処理を示すフローチャートである。この図12の各ステップ毎に説明する。

【0110】S101では、CPU11は、検索キーとして指定された使用時刻を製造時刻とした管理データで

あって、不良品が発見された工程よりも1段階だけ下流側の工程に関する管理データを、自己のHDD13内で検索する。この検索の結果、該当する管理データが探し出された場合、CPU11は、その管理データを、特定したものと扱う。

【0111】次のS102では、CPU11は、S101における検索の結果、該当する管理データが特定されたか否かをチェックする。そして、管理データが特定された場合には、CPU11は、処理をS104へ進めるが、そうでない場合には処理をS103へ進める。

【0112】S103では、CPU11は、S101による直前の検索の結果、管理データが特定されなかったため、S004又はS007において既に特定していた管理データに対応する製品（あるいは、前回以前に実行したS101において特定した管理データに対応する製品）に、不良が発生していたと、判断する。そして、CPU11は、当該管理データの工程名が示す工程の次工程において現在製造中の製品に不良品が存在する旨を、追跡結果とし、この追跡結果をPC2へ送信する。PC2は、この追跡結果をCRT等に表示することにより、作業員に対して通知する。このS103の完了後、CPU11は、この不良品追跡サブルーチンを終了する。

【0113】S104では、CPU11は、S101による検索により特定された管理データが、使用時刻を有しているか否かをチェックする。そして、有している場合、CPU11は、処理をS105へ進める。しかし、CPU11は、当該管理データが使用時刻を有していない場合、処理をS106へ進める。

【0114】S105では、CPU11は、S101にて特定された管理データの使用時刻を検索キーとして指定したうえで、処理をS101へ戻す。

【0115】S106では、CPU11は、S101にて特定された管理データが、搬入時刻を有しているか否かをチェックする。そして、有している場合、処理をS107へ進める。しかし、CPU11は、当該管理データが搬入時刻を有していない場合、処理をS108へ進める。

【0116】S107では、CPU11は、S101にて特定された管理データの箱記号が示す箱の中に、不良品が格納されていると、判断する。さらに、当該管理データが使用時刻を有しておらず、かつ、搬入時刻を有するので、CPU11は、不良品を格納した箱は、既に次工程において搬入されているが、まだ使用されていないと、判断する。そして、CPU11は、特定された管理データの箱記号が示す箱に不良品が格納されており、この箱は、特定された管理データの工程名データが示す工程の次工程における部品入庫倉庫内に格納されている旨を、追跡結果とし、この追跡結果をPC2へ送信する。PC2は、この追跡結果をCRT等に表示することにより、作業員に対して通知する。

【0117】S108では、CPU11は、特定された管理データの箱記号が示す箱の中に、不良品が格納されていると、判断する。さらに、当該管理データが搬入時刻を有しないので、CPU11は、不良品を格納した箱は、まだ次工程に到着していないと、判断する。そして、CPU11は、特定された管理データの箱記号が示す箱に不良品が格納されており、この箱は、特定された管理データの工程名データが示す工程の次工程へ搬送中である旨を、追跡結果とし、この追跡結果をPC2へ送信する。PC2は、この追跡結果をCRT等に表示することにより、作業員に対して通知する。

【0118】このように実施される不良品追跡処理につき、以下、より具体的に説明する。即ち、上述の如く、図9に示される製造が行われた結果、サーバ1のHDD13内に、図10に示される各管理データが格納されたことを前提とする。ここで、例えば、作業員は、図9におけるT29の時点でF工程で製造開始された製品に、不良が発生したことを、発見したとする。さらに、作業員はこの不良の原因は、B工程において生産された製品にあることを、突き止めたとする。この場合、作業員は、例えば、最寄のPC2を用いてサーバ1にアクセスし、このサーバ1に対して不良品追跡を指示する。このとき、作業員は、PC2を介してサーバ1に対し、F工程で現在製造中の製品に不良が発生していること、及び、当該不良の原因は、B工程に由来することを、通知する。

【0119】すると、サーバ1は、この通知内容を取得する(S001)。さらに、サーバ1は、端末3Fから、現在F工程で製造中の製品に関する製造時刻「T29」を取得する(S002)。そして、サーバ1は、各工程間の接続関係を示すテーブルを参照し(S003)、不良が発見されたF工程と、原因となる部品を供給したB工程との接続関係を調べ、B工程→C工程→F工程という接続関係を認識する。

【0120】そして、サーバ1は、F工程において時刻「T29」に開始された製造において、部品として使用された管理データを検索する。即ち、各管理データにおいて、その使用時刻フィールドに「T29」が格納されているとともにその工程名フィールドに「C」が格納された管理データを、特定する(S004)。ここでは、図10の(C-1)が特定されることになる。

【0121】そして、サーバ1は、特定された管理データがB工程に対応するものでないことを確認(S005)したうえで、特定された管理データに対応する製品が製造された時刻を、取得する(S006)。即ち、図10の(C-1)の管理データにおける製造時刻フィールドに格納された「T18」が、取得される。そのうえで、サーバ1は、図10の(C-1)の管理データに対応する製品が製造された際に、使用された部品を検索して特定する。即ち、サーバ1は、各管理データのうち、

その使用時刻フィールドに「T18」が格納されているとともにその工程名フィールドに「B」が格納された管理データを特定する(S007)。ここでは、図10の(B)の管理データが特定される。

【0122】この図10の(B)の管理データは、その工程名フィールドに「B」が格納されているので、サーバ1は、この管理データが、不良品の原因となった部品に対応する管理データであるということを、認識する(S008)。

【0123】ここで、サーバ1は、各工程の接続関係における上流側への調査を終え、下流側への調査を開始する。まず、サーバ1は、図10の(B)の管理データに対応する製品が、次のC工程において部品として使用された時刻を取得する(S009)。即ち、サーバ1は、図10の(B)の管理データにおける使用時刻フィールドに格納された「T18」及び「T22」を、取得する。このように、図10の(B)管理データに対応する製品は、次のC工程において2回に分けて使用されている。従って、以降、C工程における「T18」に開始された製造、及びC工程における「T22」に開始された製造の双方について、調査しなければならない。

【0124】一方の「T18」に関して、サーバ1は、各管理データのうち、その工程名フィールドに「C」が格納されているとともに、その製造時刻フィールドに「T18」が格納されている管理データを、検索して特定する(S101)。ここでは、図10の(C)-1の管理データが特定されることになる。さらに、サーバ1は、この図10の(C)-1の管理データに対応する製品が、次のF工程において部品として使用された時刻を取得する。即ち、サーバ1は、図10の(C)-1の管理データにおける使用時刻フィールドに格納された「T29」を取得する(S105)。しかし、サーバ1は、この「T29」を製造時刻とする管理データを検索(S101)した結果、該当する管理データがないことを確認(S102)し、図10の(C)-1の管理データに対応する工程であるC工程の次のF工程における「T29」の製造に関して、不良が発生していることを、認識する。

【0125】他方の「T22」に関して、サーバ1は、各管理データのうち、その工程名フィールドに「C」が格納されているとともに、その製造時刻フィールドに「T22」が格納されている管理データを、検索して特定する(S101)。ここでは、図10の(C)-2の管理データが特定されることになる。さらに、サーバ1は、この図10の(C)-2の管理データの使用時刻フィールドが、空欄であることを確認する(S104)。また、サーバ1は、図10の(C)-2の管理データの搬入時刻が空欄ではないことを確認する(S106)。このことにより、サーバ1は、図10の(C)-2の管理データに対応する製品が、既に、F工程に部品として

搬入されたものの、まだF工程において使用されていないということを、認識する。

【0126】即ち、サーバは、図10の(C)-2の管理データに対応する部品は、F工程の部品入庫倉庫内に格納されていると、判断するのである。さらに、サーバ1は、この図10の(C)-2の管理データにおける箱記号フィールドに格納された「c2」を取得する。

【0127】そして、サーバ1は、不良品追跡結果を作業者の最寄のPC2のCRT等に表示させる。即ち、不良の原因となった部品が組み込まれた物品(部品/製品)は、現在F工程において製造中の製品である旨が表示される(S103)とともに、不良の原因となった部品が組み込まれた物品(部品/製品)は、F工程の部品入庫倉庫内に格納された箱c2内の部品である旨が表示される(S107)のである。作業者は、この不良品追跡結果を受けて、現在F工程において製造中の製品中に不良が発生しているだけでなく、F工程の部品入庫倉庫に格納された箱c2内の部品にも不良が発生していたことを、認識することができる。

【0128】一般に、ある工程において製造された製品中に不良品が発見された場合、同時に製造されていた同一LOTの製品、即ち、同じ箱に格納された各製品の多くに、同様の不良が発生している可能性が高い。従って、同時に製造された製品の全ての行方を追跡しなければならない。しかしながら、上述したように、当該製品は、次工程において、複数回に分けて使用されることもあるわけである。このように、複数の工程が接続された生産工程群に対して、本工程管理システムが適用されると、作業者は、不良の原因となった部品が使用された物品(部品/製品)の全てを、確実に追跡することができるのである。

【0129】従って、作業者は、全工程における各部品及び各製品を、全て除去したり検査し直すことなく、不良の原因となった部品が使用された物品(部品/製品)のみを、確実に除去することができるのである。

【0130】尚、該システム外から搬入される部品とのデータの結合は、その部品の製造時刻の代わりに部品番号又はロット番号を入力すればよい。システム外へ製品が搬出される場合は、使用時刻の代わりに製品番号又はロット番号を入力すればよい。

【0131】〔変形例1〕上記実施形態では、管理データの製造時刻フィールドには、製造が開始された時刻が格納されることになっていた。代わりに、この製造時刻フィールドに、製造終了時刻が格納されることとしてもよい。また、この製造時刻フィールドに、製造開始時刻、及び製造終了時刻の双方が、格納されることとしてもよい。

【0132】〔変形例2〕上記実施形態では、管理データは、搬出時刻フィールド、搬入時刻フィールド、工程名フィールド、箱記号フィールド、製造時刻フィール

ド、及び使用時刻フィールドを、備えていた。さらに、この管理データは、その他の情報を格納するための付帯情報フィールドを備えることとしてもよい。

【0133】そして、この付帯情報フィールドには、例えば、製造された製品の数量、正しく完成された製品の数量、不良品の数量、及び不良率等の情報が、格納されることとしてもよい。

【0134】また、この付帯情報フィールドには、例えば、当該管理データの工程名フィールドが示す工程から搬出された製品が、次工程において部品として搬入されるまでの平均的な時間(リードタイム)の情報が、格納されることとしてもよい。

【0135】作業者は、この付帯状況フィールド内の情報を参照することにより、各工程における不良発生 の程度や、各工程間を移動するのに要する時間を知ることができ、各工程における製品の製造数を調整する等、適切な生産管理を行うことができる。

【0136】

【発明の効果】以上のように構成された本発明の工程管理システムによると、各工程内及び各工程間を移動しながら処理されていく物品に関し、当該処理が行われた時刻をキーとして、その処理の履歴を簡便に調査することができる。

【図面の簡単な説明】

【図1】 工程内における各倉庫間の部品/製品の移動を示す説明図

【図2】 各工程間の接続関係を示す模式図

【図3】 本発明の一実施形態による工程管理システムを示す構成図

【図4】 本発明の一実施形態による工程管理システムのサーバを示す構成図

【図5】 本発明の一実施形態による工程管理システムの端末を示す構成図

【図6】 A工程における管理データの更新を示す説明図

【図7】 B工程における管理データの更新を示す説明図

【図8】 C工程における管理データの更新を示す説明図

【図9】 各工程間における部品/製品の流れの一例を示す説明図

【図10】 サーバ内の管理データの一例を示す説明図

【図11】 不良品追跡処理を示すフローチャート

【図12】 不良品追跡処理を示すフローチャート

【符号の説明】

1 サーバ

11 CPU

12 RAM

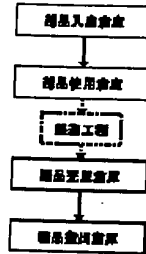
13 HDD

50 3A~3F 端末

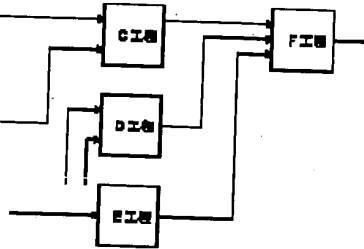
31 PLC
32 表示入力装置

33 バーコードリーダー
M 時計

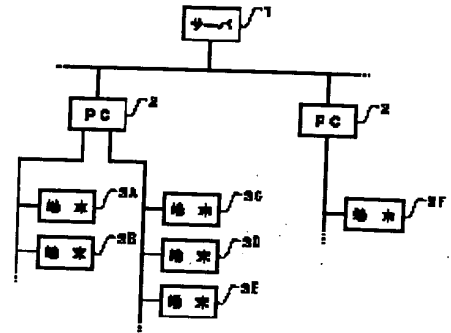
【図1】



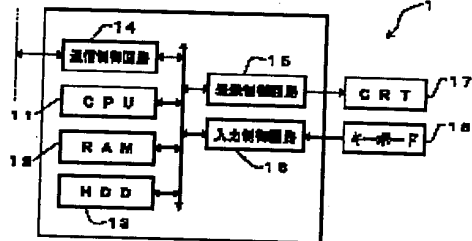
【図2】



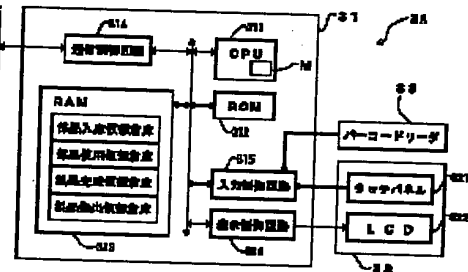
【図3】



【図4】



【図5】



【図6】

出力時刻	入力時刻	工程名	施設号	製造時刻	使用時刻
T11		A	a1	T10	

出力時刻	入力時刻	工程名	施設号	製造時刻	使用時刻
T11	T10	A	a1	T10	

出力時刻	入力時刻	工程名	施設号	製造時刻	使用時刻
T11	T10	A	a1	T10	T10

【図7】

出力時刻	入力時刻	工程名	施設号	製造時刻	使用時刻
T12		B	b1	T12	

出力時刻	入力時刻	工程名	施設号	製造時刻	使用時刻
T12	T12	B	b1	T12	

出力時刻	入力時刻	工程名	施設号	製造時刻	使用時刻
T12	T12	B	b1	T12	T10

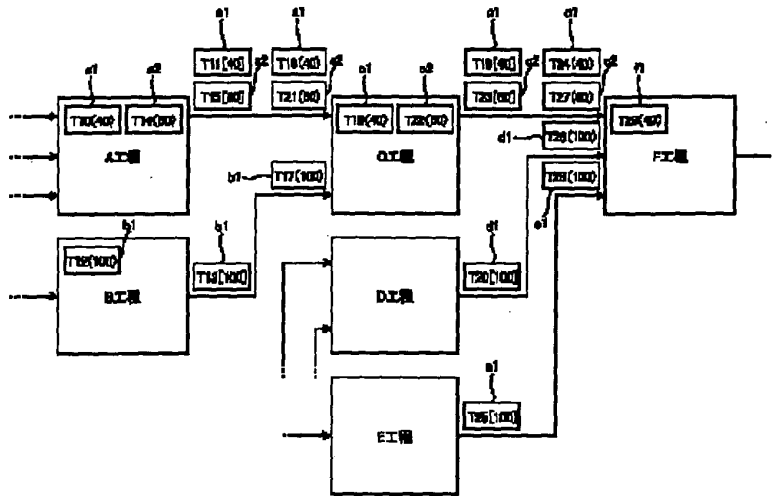
出力時刻	入力時刻	工程名	施設号	製造時刻	使用時刻
T12	T12	B	b1	T12	T10, T12

【図8】

出力時刻	入力時刻	工程名	施設号	製造時刻	使用時刻
		C	c1	T10	

出力時刻	入力時刻	工程名	施設号	製造時刻	使用時刻
T10		C	c1	T10	

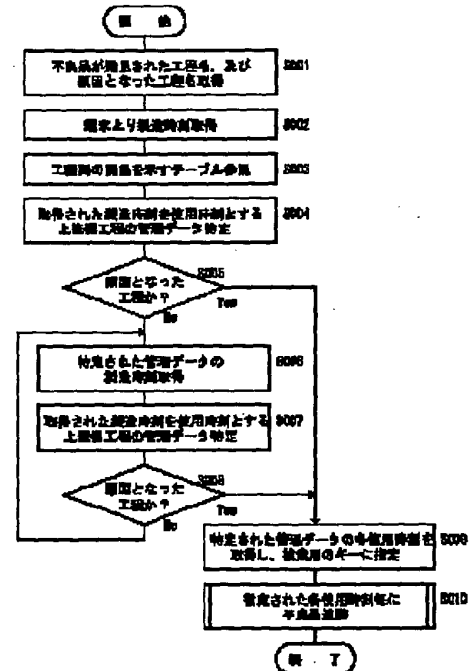
【図 9】



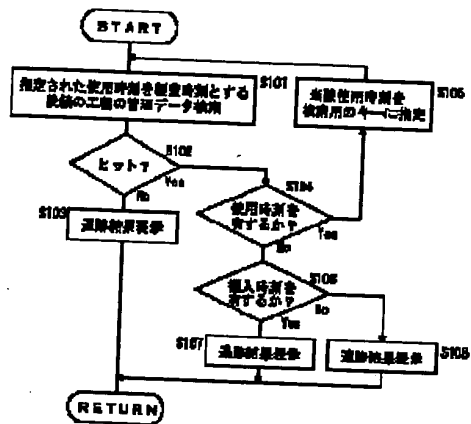
【図 10】

(A)-1	発注時刻	発注時刻	工程名	部品番号	製造時刻	使用時刻
	T11	T12	A	a 1	T10	T13
(A)-2	発注時刻	発注時刻	工程名	部品番号	製造時刻	使用時刻
	T14	T15	A	a 2	T14	T22
(B)	発注時刻	発注時刻	工程名	部品番号	製造時刻	使用時刻
	T16	T17	B	b 1	T12	T18, T22
(B)-1	発注時刻	発注時刻	工程名	部品番号	製造時刻	使用時刻
	T19	T20	C	c 1	T18	T20
(B)-2	発注時刻	発注時刻	工程名	部品番号	製造時刻	使用時刻
	T23	T24	C	a 2	T22	

【図 11】



【図 12】



フロントページの続き

Fターム(参考) 3C042 RE07 RH03 RH05 RJ13 RJ17
 RJ20 RK05 RK11 RK17 RK22
 RK28 RK29
 3F022 EE05 MM08 MM28 MM32 NN38
 PP04
 5B049 BB07 CC21 CC23 CC27 DD01
 DD02 EE56 FF03 GG02 GG04
 GG07 GG08

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-056707

(43)Date of publication of application : 27.02.2001

(51)Int.Cl. G05B 19/418
 B23Q 41/08
 B65G 1/137
 G06F 17/60

(21)Application number : 11-233187

(71)Applicant : ASAHI OPTICAL CO LTD

(22)Date of filing : 19.08.1999

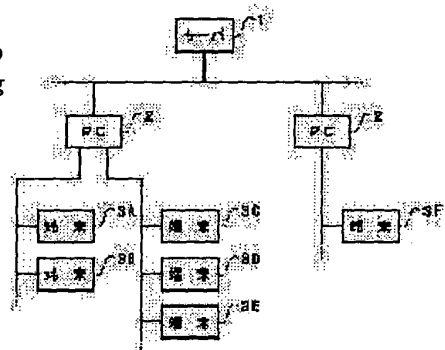
(72)Inventor : NAKAMURA KAZUO

(54) PROCESS MANAGING SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a process managing system capable of tracking a defective article in a process.

SOLUTION: This process managing system is composed of respective terminals 3A-3F arranged corresponding to respective processes for producing a product while using a produce in a preprocess as a component and for ejecting the finished product to the next process and a server 1 connected to the respective terminals 3A-3F. Each of terminals 3A-3F has a clock M for acquiring time when production in each process is started. Then, the process names of respective processes, the production time of the product in the relevant process and time in the case of using the provided product as a component in the following process are preserved in the server 1 and the terminals 3A-3F as one set of managing data. On the basis of these managing data, the flows of articles inside respective processes and between respective processes can be specified. Further, on the basis of these managing data, the defective articles existent in various states inside respective processes are tracked.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision]

of rejection]

[Date of requesting appeal against examiner's
decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] The production control system which manages each process which outputs the goods obtained by processing while processing the goods which are characterized by providing the following, and which were outputted as an output object from the last process as an input object, respectively to the following process as an output object, two or more time checks which acquire the processing time to the input object in each aforementioned process — a means the above — each — a time check — a storage means to memorize the 1st processing time which is the processing time in the process which shows the process name which is connected to a means, respectively and shows each process uniquely, and this process name, and the 2nd processing time which is the processing time in the following process over the output object from the process concerned as management data of a lot

[Claim 2] Where more than one are summarized, the aforementioned goods are received as an input object in the following process while they are outputted as an output object, and are set at this following process. Quantity extraction of the arbitration is carried out and it is processed. the aforementioned management data between each process which corresponds to the aforementioned goods in the state where more than one were summarized, and adjoins each other — setting — unique — oneself and others — the production control system according to claim 1 characterized by having further the local identifier to which the aforementioned goods which move between each process which adjoins each other were made to correspond while it was identifiable

[Claim 3] It is the production control system according to claim 2 characterized by having further a reading means for the aforementioned goods to be stored in the storing object to which the aforementioned local identifier was given between each process in each process which adjoins each other where more than one are summarized, and to read the aforementioned local identifier.

[Claim 4] When the cause process of the upstream which went back the process concerned while the output object by which the aforementioned control means were processed at predetermined processing time in the predetermined process was specified is specified, The 1st processing time of the management data which specified the management data which makes the aforementioned predetermined processing time the 2nd processing time among the management data which have the process name which shows the last process of the aforementioned predetermined process, and was specified immediately before is acquired. The processing which newly specifies the management data which contains the 1st processing time acquired while including the process name which shows the last process of the process which the process name of the management data concerned shows as 2nd processing time The production control system according to claim 2 or 3 characterized by repeating until it specifies management data including the process name which shows the aforementioned cause process.

[Claim 5] It is the production control system according to claim 4 carry out acquiring the local identifier contained in the management data which repeated the processing which newly specifies the management data which contains the processing time of the above 2nd of the aforementioned management data as 1st processing time while including the process name which

shows the following process of the process which the process name of the management data which the aforementioned control means specified management data including the process name which shows the aforementioned cause process, and specified immediately before shows, and was finally specified as the feature.

[Claim 6] the above — each — a time check — the production control system according to claim 1 to 5 characterized by a means acquiring the start time of the processing in a corresponding process as processing time

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the production control system which manages each process in the work which consists of two or more processes connected mutually.

[0002]

[Description of the Prior Art] Generally, the product manufactured with various production facilities is constituted by two or more parts. These each part article will be manufactured as a product in other production facilities, if it goes back. here, if it becomes, a final product will be obtained for the first time by [which call process the functional unit which receives parts and manufactures a product] connecting each [these] process in predetermined sequence — it divides and comes out

[0003] Therefore, either of each process of the upstream which the cause of poor generating may be in the process concerned, and supplied parts into the product which should have been manufactured in a certain process at the process concerned when it was discovered that the defective had occurred may be related to generating of a defective.

[0004] Now and temporarily, it is discovered that the defective had occurred in the product manufactured in a certain process, and it presupposes further that it was checked that the parts manufactured in the process with an upstream were the causes of generating of this defective. In such a case, the parts used as the problem may exist in each stage of each process. Therefore, an operator interrupts manufacture of a product, in each process with the misgiving related to poor generating, he has to remove all of the parts and product which exist in each stage of each [these] process, has to reinspect, or there must be.

[0005]

[Problem(s) to be Solved by the Invention] When a defective is discovered, in order to remove the defective concerned from between the inside of each process, and each process according to the above-mentioned conventional technology, there was a problem [say / that great time and a great effort are applied].

[0006] Usually, a poor cause exists only in the limited time set at a certain process. for this reason, when the defective had been manufactured, in the process concerned, it was manufactured simultaneously — the same — only each part article of LOT is a defective by high probability Therefore, it is desirable to remove only all the parts concerned of LOT. However, since as parts or this part of LOT is already incorporated as a product in many consecutive processes, the operator is unable to specify all the things concerning the LOT concerned from the parts in each process, and a product as a matter of fact.

[0007] of course, the same — an operator can also manage the flow of the parts within each process and between each process to all the parts manufactured as LOT by giving the stamp which shows the LOT concerned However, considering the initial cost of the marking press, and the cost concerning the employment, the product finally manufactured will become expensive.

[0008] Then, a process is managed simple, without using an expensive device, and let it be the technical problem of this invention to offer the production control system which can be pursued

certainly for a defective.

[0009]

[Means for Solving the Problem] In this invention, in order to solve the above-mentioned technical problem, the following composition was adopted.

[0010] Namely, the production control system of this invention is a production control system which manages each process which outputs the goods obtained by processing while processing the goods outputted as an output object from the last process as an input object, respectively to the following process as an output object. two or more time checks which acquire the processing time to the input object in each aforementioned process — with a means the above — each — a time check — it connecting with a means, respectively and the 1st processing time which is the processing time in the process which shows the process name which shows each process uniquely, and this process name, and the 2nd processing time which is the processing time in the following process over the output object from the process concerned It is characterized by having a storage means to memorize as management data of a lot.

[0011] In addition, where more than one are summarized, the aforementioned goods are received as an input object in the following process while they are outputted as an output object, and they are good in this following process also as arbitrary things which quantity extraction is carried out and are processed. and between each process which corresponds to the aforementioned goods in the state where two or more aforementioned management data were gathered, and adjoins each other — setting — unique — oneself and others — it is good also as having further the local identifier to which the aforementioned goods which move between each process which adjoins each other were made to correspond while it was identifiable Furthermore, two or more goods may be dealt with in the state where it was stored in the storing inside of the body of a box and others. moreover — this box — oneself and others, such as a box sign, i.e., a bar code, a sign, or an image, — the identifiable local identifier is attached and its peach is good

[0012] Moreover, when the cause process of the upstream which went back the process concerned while the output object by which the control means of the aforementioned production control system were processed at predetermined processing time in the predetermined process was specified is specified, The 1st processing time of the management data which specified the management data which makes the aforementioned predetermined processing time the 2nd processing time among the management data which have the process name which shows the last process of the aforementioned predetermined process, and was specified immediately before is acquired. It is good also as repeating until it specifies management data including the process name which shows the aforementioned cause process for the processing which newly specifies the management data which contains the 1st processing time acquired while including the process name which shows the last process of the process which the process name of the management data concerned shows as 2nd processing time.

[0013] Furthermore, it is good also as acquiring the local identifier contained in the management data which repeated the processing which newly specifies the management data which contains the processing time of the above 2nd of the aforementioned management data as 1st processing time while including the process name which shows the following process of the process which the process name of the management data which these control means specified management data including the process name which shows the aforementioned cause process, and was specified immediately before shows, and was finally specified.

[0014] For example, the output object of a certain process is a defective, and when it is in the output object with which this poor cause was outputted from the upstream process (cause process), the control means of a production control system can pursue all the output objects used as the cause.

[0015] In addition, each above-mentioned process may be a manufacturing process which carries in the product (output object) taken out from the last process as parts (input object), manufactures a product using this part, and takes out the obtained product to the following process. and the product manufactured in a certain process at the period is the same — it is good also as being dealt with in the state where it was collected as LOT Moreover, in each process, the product carried in where more than one are summarized may be used, dividing into

multiple times, after being divided into arbitrary quantity. Moreover, each above-mentioned process may be a process on the physical distribution which conveys goods, and a process on goods sale.

[0016] In addition, processing time may be the time when processing was started, may be the time which processing ended, and may be the both sides of the time when processing was started, and the ended time. moreover, each process — the time check to kick — a means interlocks with [the production facility in each process] and is automatic — it is good also as being able to clock and clocking based on directions of an operator

[0017]

[Embodiments of the Invention] the following and a drawing — being based — 1 operation gestalt ***** explanation of this invention — it carries out The production control system by this operation gestalt is for managing the whole production process group which consists of two or more processes. First, this "process" is explained. A process here is a predetermined batch in production, and it has the function to manufacture a product using the received parts. That is, a process is a functional unit realized by the operator who performs a production activity using the various warehouses which store various production facilities, and parts and products, such as a machine tool installed in the predetermined field in production facilities, such as works, and these production facilities and a warehouse.

[0018] Moreover, each of these processes are connected in predetermined sequence. And each process manufactures a product using the parts taken out from the last process, and takes out the obtained product to the following process. In addition, parts/product is dealt with per LOT. That is, in a box (storing object), parts/product will be dealt with, where [of 50 pieces or 300 pieces / which was settled] quantity storing is carried out. Moreover, the unique box sign (local identifier) for distinguishing the box of this ** from other boxes is given to each box. More specifically, the bar code which shows the box sign of the box is stuck on the front face of each box.

[0019] The various warehouses in each above-mentioned process consist of a part warehousing warehouse, a part use warehouse, a product completion warehouse, and a product taking-out warehouse. Hereafter, drawing 1 is referred to and movement of the parts/product between each warehouse within a process is explained.

[0020] First, if the box with which parts were stored in a certain process arrives, an operator will store this box in a part warehousing warehouse, and will keep it. And in case manufacture is started, an operator chooses a required thing among the boxes stored in the part warehousing warehouse, and moves to a part use warehouse. The parts in the box with which the operator was moreover moved to this part use warehouse are used, and a product is manufactured. In addition, the completed product is stored one by one in a box other than the box in which parts were stored. After manufacture is completed, an operator stores the box with which the product was stored into a product completion warehouse, and keeps it. And in the case of product shipment, an operator chooses a required thing among the boxes stored in the product completion warehouse, and moves to a product taking-out warehouse. In addition, the box moved to the product taking-out warehouse is immediately taken out towards the following process.

[0021] The final product used as the purpose is produced by connecting such each process in predetermined sequence. Drawing 2 is the ** type view showing the connection relation between each process. In addition, six processes in two or more processes, i.e., A process, B process, C process, D process, E process, and F process are typically shown in this drawing 2.

[0022] In this drawing 2, C process receives the product (output object) completed in B process as parts (input object) in the C process concerned while receiving the product (output object) completed in A process as parts (input object) in the C process concerned. Furthermore, process assembly, processing, etc. to the received parts, it is made to complete as a product in the C process concerned, and C process is sent to F process by using this product as an output object.

[0023] And F process receives the product by D process as parts, and receives the product by E process as parts while it receives the product by C process as parts. Furthermore, F process completes a product with the received parts. In addition, the product by this F process is also

the final product of the whole production process group.

[0024] Next, the composition of a production control system for managing each process in an above-mentioned production process group is explained. Drawing 3 is the block diagram showing the production control system by this operation gestalt. This production control system has a server 1, two or more personal computers (Following PC and brief sketch) 2 connected to this server 1 through the network, respectively, and two or more terminals 3A-3F connected to each PC2, respectively. In addition, each terminals 3A, 3B, and 3C, 3D, and 3E and 3F are made to correspond to each process, i.e., A process, B process, C process, D process, E process, and F process, respectively, and they are arranged.

[0025] Drawing 4 is the block diagram showing a server 1. As shown in this drawing 4, a server 1 has CPU11, RAM12 and HDD13 which were mutually connected by bus, the communications control circuit 14, the display-control circuit 15, and the input-control circuit 16. Furthermore, a server 1 has CRT17 connected to the display-control circuit 15, and the keyboard 18 connected to the input-control circuit 16. Moreover, the server 1 is connected to the network by the communications control circuit 14.

[0026] Various programs, such as an operating system and a database program, are beforehand memorized by HDD13. Moreover, the table showing the connection relation between each process shown in drawing 2 is beforehand memorized by this HDD13.

[0027] CPU11 reads the program stored in this HDD13, and it is made to perform it, after developing the predetermined field of RAM12. And CPU11 can make required information transmit to an operator by controlling the display-control circuit 15 and carrying out a screen display of the picture to CRT17. And if an operator performs alter operation to a keyboard 18, CPU11 can detect the alter operation concerned through the input-control circuit 16. Although explained later, when a defect occurs for the manufactured product, an operator can direct a defective trace to a server 1.

[0028] in addition, each PC2 — the above-mentioned server 1 and abbreviation — it is the same composition and connects with this server 1 through the network, respectively. And two or more terminals 3A-3F are connected to each PC2 through the network, respectively. Drawing 5 is explanatory drawing showing the composition of terminal 3A. In addition, each of other terminals 3B-3F have the same composition as this terminal 3A, respectively. As shown in this drawing 5, terminal 3A has a programmable logic controller (it is described as Following PLC) 31, display-input equipment 32, and a bar code reader 33.

[0029] PLC31 has CPU311, ROM312 and RAM313 which were mutually connected by bus, the communications control circuit 314, the input-control circuit 315, and the display-control circuit 316. moreover, CPU311 — a time check — the clock M as a means is built in and time (at a year, the moon, a day, the time a part, a second) can be acquired by this clock M. In ROM312, various programs, such as a database program, are memorized beforehand. RAM313 has a field for performing the program memorized by ROM312, and the field used as each virtual warehouse mentioned later.

[0030] In addition, each [these] virtual warehouse, i.e., a part warehousing virtual warehouse, the part use virtual warehouse, the product completion virtual warehouse, and the product taking-out virtual warehouse are typically shown in drawing 5. Although explained later Each virtual warehouse (carrying-in virtual warehouse section), i.e., a part warehousing virtual warehouse, a part use virtual warehouse (use virtual warehouse section), A product completion virtual warehouse (completion virtual warehouse section) and a product taking-out virtual warehouse (taking-out virtual warehouse section) make each warehouse within an actual process, i.e., the part warehousing warehouse shown in drawing 1, a part use warehouse, a product completion warehouse, and a product taking-out warehouse correspond, respectively, and are prepared on RAM313.

[0031] Display-input equipment 32 has a touch panel 321 and a liquid crystal panel (it is described as Following LCD) 322. A touch panel 321 is connected to the input-control circuit 315 of PLC31 while it is arranged on the screen of LCD322. Moreover, LCD322 is connected to the display-control circuit 316 of PLC31. The bar code reader 33 as a reading means can read a bar code while connecting with the input-control circuit 315 of PLC31. That is, this bar code

reader 33 is used in order to make the bar code as a local identifier given to the box which stored parts/product read.

[0032] And the predetermined field of RAM313 is developed and CPU311 of PLC31 performs the program stored in ROM312. Moreover, CPU311 of PLC31 controls the display-control circuit 316, and displays a picture on LCD322 of display-input equipment 32. In this picture, two or more button, i.e., carrying-in button, use buttons, manufacture start buttons, manufacture end buttons, and taking-out buttons are contained.

[0033] An operator can perform alter operation by pushing each button displayed on LCD322. That is, the touch panel 321 arranged on the screen of LCD322 can detect the position on the screen pushed by the operator, and can transmit the signal which shows this position to the input-control circuit 315 of PLC31. And while CPU311 detects the position on the screen pushed by the operator through this input-control circuit 315, this position can recognize with which button on a screen it has lapped.

[0034] Moreover, when an operator makes a bar code read by the bar code reader 33, this bar code reader 33 acquires the bar code data corresponding to the bar code concerned, and transmits to the input-control circuit 315 of PLC31. CPU311 of PLC31 can acquire bar code data through this input-control circuit 315.

[0035] Thus, each constituted terminals 3A-3F are connected to the network through the communications control circuit 314.

[0036] In addition, CPU11 of a server 1 and CPU311 of Terminals 3A-3F are equivalent to control means. Moreover, RAM12 and HDD13 of a server 1, and RAM313 of Terminals 3A-3F are equivalent to a storage means.

[0037] Next, the correspondence relation between the flow of the parts/product in each actual process and the flow of data processing in a production control system is explained. In addition, parts/product is dealt with in the state of some quantity conclusion **** as mentioned above (stored in a box).

[0038] The production control system is making the management data of one unit correspond in this way for every part / product of a certain quantity conclusion **** state. In addition, each management data is processed by the database program in a server 1, and the database program in each terminals 3A-3F. Moreover, although explained later, each management data has each field of "taking-out time", "carrying-in time", a "process name", a "box sign", "manufacture time", and "use time." And if goods (parts/product) move between each process in each process, corresponding management data will be updated in a production control system in the state of having been in agreement with the flow of these goods (parts/product).

[0039] For example, if its attention is paid to C process in drawing 2, while receiving like **** the product shipped from A process as parts in the C process concerned at this C process, the product shipped from B process will be received as parts in the C process concerned. Here, the product manufactured in A process is taken out to C process in the state where it was stored in the box to which the predetermined box sign (a1, a2, a3, —) was given. in addition, suppose hereafter that the thing of the box to which the box sign "a1" was given is written as "a box a1" (others — it writes similarly about the box to which the box sign was given)

[0040] Terminal 3A transmits the management data corresponding to the time of product taking out from this A process to a server 1 and terminal 3C. Drawing 6 shows this management data typically. in addition, the contents are updated one by one and this management data is ** as processing progresses And (I) of drawing 6 shows the state of the management data at the time of a box a1 being taken out from A process.

[0041] Here, (I) of this drawing 6 is taken for an example, and each field in management data is explained. The process name field is the field for storing the process name by which the product corresponding to the management data concerned was manufactured. "A" which shows A process is stored in the process name field in (I) of drawing 6.

[0042] The taking-out time field is the field for storing the time (taking-out time) when the product was taken out from the process (A process in this case) which the process name stored in the process name field shows. "T11" is stored in the taking-out time field in (I) of drawing 6.

[0043] The carrying-in time field is the field for the product taken out in this way storing the

- time (carrying-in time as carrying-in information) carried in as parts in the next process (C process in this case) of the process concerned. In addition, since (I) of drawing 6 still shows the management data at the time of carrying in [in / the following C process / taking out from A process was just performed, and] not being made, this carrying-in time field serves as a blank.
- [0044] The box sign field is the field for storing the box sign of the box with which the completed product was held. "a1" is stored in the box sign field in (I) of drawing 6.
- [0045] The manufacture time field is the field for storing the time (manufacture time) when manufacture of a product was started. This manufacture time is equivalent to the 1st processing time. "T10" is stored in the manufacture time field in (I) of drawing 6.
- [0046] In the following process (C process in this case) of a process that the product was manufactured, the use time field is the field for storing the time (it being called use time since it is used as parts) when this manufacture is started, in case this product is used as parts and manufacture is performed. This use time is equivalent to the 2nd processing time. In addition, in (I) of drawing 6, since the product by A process is not used as parts in the following C process yet, this use time field is a blank.
- [0047] If the management data ((I) of drawing 6) of such composition is transmitted from terminal 3A, a server 1 will receive and hold this management data. Moreover, terminal 3C receives this management data, and stores it in the part warehousing virtual warehouse. In addition, the actual thing (the product in A process, i.e., the parts in C process) which corresponds at this time has not reached C process yet. This is checked when the carrying-in time field of the management data concerned is a blank.
- [0048] An operator makes the bar code of a box a1 read by the bar code reader 33 soon, if a box a1 reaches C process while directing carrying-in processing by carrying out the depression of the carrying-in button of the display-input equipment 32 to terminal 3C. Then, terminal 3C acquires time "T16" as carrying-in time by the clock M while acquiring the bar code data in which a box sign "a1" is shown. And terminal 3C searches and specifies the management data by which "a1" was stored in the box sign field among the management data stored in the part warehousing virtual warehouse. Carrying-in time "T16" is stored in the carrying-in time field of management data where terminal 3C was moreover specified. Thus, the updated management data is shown in (II) of drawing 6.
- [0049] Simultaneously, terminal 3C sets a box sign "a1" and carrying-in time "T16" as a carrying-in signal, and transmits this carrying-in signal to a server 1 and terminal 3A. A server 1 receives this carrying-in signal, and acquires the box sign "a1" and carrying-in time "T16." And the carrying-in time field is a blank among the management data currently held, and a server 1 searches and specifies the management data by which "a1" was stored in the box sign field. Carrying-in time "T16" is stored in the carrying-in time field of management data where the server 1 was moreover specified. On the other hand, terminal 3A also receives a carrying-in signal, and updates the management data which corresponds similarly.
- [0050] In addition, the box a1 carried in to C process in this way is kept after the reading processing by the bar code reader 33 of terminal 3C, and in a part warehousing warehouse. Moreover, in C process, the goods in this box a1, i.e., the product in A process, will be dealt with as parts.
- [0051] As mentioned above, corresponding to the flow of the goods from A process to C process, the management data in a production control system is updated. Similarly, corresponding to the flow of the goods from B process to C process, the management data in a production control system is updated. Drawing 7 shows this management data typically. That is, when the product manufactured in B process is taken out towards C process in the state where it was stored in the box b1, the corresponding management data in terminal 3B is transmitted towards a server 1 and terminal 3C. As this management data is shown in (I) of drawing 7, each of the carrying-in time fields and use time fields is blanks. A server 1 receives and holds the management data ((I) of drawing 7) transmitted from terminal 3B. Moreover, terminal 3C receives this management data, and stores it in the part warehousing virtual warehouse.
- [0052] An operator makes the bar code of a box b1 read by the bar code reader 33 soon, if a box b1 reaches C process while directing carrying-in processing by carrying out the depression

of the carrying-in button of the display-input equipment 32 to terminal 3C. Then, terminal 3C acquires time "T17" as carrying-in time by the clock M while acquiring the bar code data in which a box sign "b1" is shown. And terminal 3C specifies the management data by which "b1" was stored in the box sign field among the management data stored in the part warehousing virtual warehouse. Carrying-in time "T17" is stored in the carrying-in time field of management data where terminal 3C was moreover specified. Thus, the updated management data is shown in (II) of drawing 7.

[0053] Simultaneously, terminal 3C sets a box sign "b1" and carrying-in time "T17" as a carrying-in signal, and transmits this carrying-in signal to a server 1 and terminal 3B. A server 1 receives a carrying-in signal and acquires the box sign "b1" and carrying-in time "T17." And the carrying-in time field is a blank among the management data currently held, and a server 1 specifies the management data by which "b1" was stored in the box sign field. Carrying-in time "T17" is stored in the carrying-in time field of management data where the server 1 was moreover specified. On the other hand, terminal 3B also receives a carrying-in signal, and updates the management data which corresponds similarly.

[0054] In addition, the box b1 carried in to C process in this way is kept after the reading processing by the bar code reader 33 of terminal 3C, and in a part warehousing warehouse. Moreover, in C process, the goods in this box b1, i.e., the product in B process, will be dealt with as parts.

[0055] And at C process, the product in the C process concerned is manufactured with the parts from A process carried in like the above, and the parts from B process. That is, the parts from A process are carried in to the part warehousing warehouse of C process in the state where it was stored in the box a1. Moreover, the parts from B process are carried in to the part warehousing warehouse of C process in the state where it was stored in the box b1. In addition, these parts are kept in the part warehousing warehouse until manufacture is started.

[0056] And in case an operator starts manufacture, he moves the box a1 and box b1 which were stored in the part warehousing warehouse to a part use warehouse. Simultaneously, an operator directs part use processing to terminal 3C by carrying out the depression of the use button of the display-input equipment 32. Then, terminal 3C displays all the management data stored in the part use virtual warehouse on the display operating set 32. An operator chooses the management data shown in (II) of drawing 6, and the management data shown in (II) of drawing 7 from the displayed management data. Then, terminal 3C moves both selected management data to a part use virtual warehouse from the part warehousing virtual warehouse.

[0057] Furthermore, an operator notifies a manufacture start to terminal 3C by carrying out the depression of the manufacture start button of the display-input equipment 32. Then, terminal 3C acquires the time "T18" of a manufacture start by the clock M. And terminal 3C specifies the management data from which the use time field became a blank among the management data in a part use virtual warehouse. "T18" is stored in the use time field of management data where terminal 3C was moreover specified.

[0058] Moreover, terminal 3C sets a box sign "a1" and time "T18" as an used signal, and transmits to a server 1 and terminal 3A. Simultaneously, terminal 3C sets a box sign "b1" and time "T18" as an used signal, and transmits to a server 1 and terminal 3B. That is, two used signals are transmitted from terminal 3C. Then, although a server 1 receives both the use signal, terminal 3A will receive only one used signal, and terminal 3B will receive only the used signal of another side.

[0059] And a server 1 acquires the box sign "a1" and use time "T18" based on one used signal. And the use time field is a blank among the management data currently held, and a server 1 searches and specifies the management data by which "a1" was stored in the box sign field. Use time "T18" is stored in the use time field of management data where the server 1 was moreover specified. Moreover, the management data to which terminal 3A corresponds similarly based on this used signal is updated. Thus, the updated management data is shown in (III) of drawing 6.

[0060] Furthermore, a server 1 acquires the box sign "b1" and use time "T18" based on the used signal of another side. And the use time field is a blank among the management data currently held, and a server 1 searches and specifies the management data by which "b1" was

stored in the box sign field. Use time "T18" is stored in the use time field of management data where the server 1 was moreover specified. Moreover, the management data to which terminal 3B corresponds similarly based on this used signal is updated. Thus, the updated management data is shown in (III) of drawing 7.

[0061] In addition, the product manufactured in A process and B process is supplied to C process as parts, and "is used" for the manufacture in the C process concerned. For this reason, the manufacture time "T18" of the product in C process is equivalent to the C process concerned for A process which supplied parts, and B process at use time.

[0062] And an operator prepares the box c1 for storing the product in the C process concerned, and makes the bar code read by the bar code reader 33 of terminal 3C. Then, terminal 3C will acquire a box sign "c1" from the acquired bar code data 33. The parts with which the operator was moreover stored in the box a1, and the parts stored in the box b1 are used, and a product is manufactured. In addition, the product completed as a result of manufacture is stored in the box of a box sign "c1."

[0063] After manufacture is completed, an operator moves the product in the state where the amount storing of predetermined numbers was carried out into the box c1 to a product completion warehouse. Simultaneously, an operator notifies a manufacture end to terminal 3C by carrying out the depression of the manufacture end button of the display-input equipment 32. Then, terminal 3C creates the management data to which the product stored in the box c1 was made to correspond, and stores it in a product completion virtual warehouse. (I) of drawing 8 shows the management data of this state. As for this management data, the taking-out time field, the carrying-in time field, and use time feed are a blank. Moreover, "C" which shows C process is stored in the process name field, and "c1" is stored in the box sign field, and "T18" which is the time of a manufacture start is stored in the manufacture time field.

[0064] Thus, the manufactured product is stored in the product completion warehouse until it is taken out to the following process. And the management data corresponding to this product also remains stored in a product completion virtual warehouse.

[0065] In addition, as for the management data shown in (III) of drawing 6, and the management data shown in (III) of drawing 7, "T18" is stored in the use time field, respectively. This is because the parts corresponding to both management data were simultaneously used in C process. However, for example, the part quantity in a box a1 is 40, and suppose that the part quantity in a box b1 was 100. Supposing one product is now manufactured by using every one part of both in C process, the quantity of the product which can be manufactured will be limited to 40 pieces using the parts in a box a1, and the parts in a box b1. Therefore, 60 pieces which remained without being used among the parts in a box b1 will be used for next manufacture.

[0066] And supposing next manufacture is started at time "T22", "T22" will be further added to the use time field, and the management data shown in (III) of drawing 7 will be updated by the state by which it is shown in (IV) of drawing 7. Thus, the use time field can hold two or more use time.

[0067] As mentioned above, when conveying the product which manufacture was completed and was saved in the product completion warehouse, an operator moves the product stored in this product completion warehouse to a product taking-out warehouse. In addition, the product moved to this product taking-out warehouse will be shipped immediately.

[0068] Simultaneously, an operator directs taking-out processing of a product to terminal 3C by carrying out the depression of the taking-out button of the display-input equipment 32. Then, terminal 3C displays each management data in a product completion virtual warehouse on the display operating set 32. An operator chooses the management data which operated the display-input equipment 32 and was shown in (I) of drawing 8 to terminal 3C. Then, terminal 3C acquires time (taking-out time) "T19" by the clock M, and stores T19 in the taking-out time field of selected management data. Moreover, terminal 3C moves this selected management data to a product taking-out virtual warehouse from a product completion virtual warehouse. The management data moved to the product taking-out virtual warehouse is shown in (II) of drawing 8.

[0069] Furthermore, terminal 3C copies this management data ((II) of drawing 8), and transmits

to a server 1 and terminal 3F. A server 1 receives and holds this management data. Moreover, terminal 3F receive this management data, and store it in the part warehousing virtual warehouse.

[0070] Thus, it turns out that each management data in a production control system is equivalent to the flow of each goods within each process and between each process (parts/product).

[0071] Hereafter, an operation of this operation form is explained. First, an example of the flow of the parts/product between each process is explained with reference to drawing 9. This drawing 9 is made to correspond to the manufacture in each process, taking out, and each processing of carrying in, and the time T10-T29 of the processing concerned is shown in it. Hereafter, it explains in order of the time series of this time T10-T29.

[0072] T10 : In A process, the product of <40> individuals is manufactured and it is stored in a box a1.

[0073] T11 : A box a1 is taken out from A process. In addition, in this box a1, the product [40] individual manufactured in A process is stored.

[0074] T12 : In B process, the product of <100> individuals is manufactured and it is stored in a box b1.

[0075] T13 : A box b1 is taken out from B process. In addition, in this box b1, the product [100] individual manufactured in B process is stored.

[0076] T14 : In A process, the product of <60> individuals is manufactured and it is stored in a box a2.

[0077] T15 : A box a2 is taken out from A process. In addition, in this box a2, the product [60] individual manufactured in A process is stored.

[0078] T16 : The box a1 conveyed from A process is carried in to C process. In addition, in this box a1, 40 products manufactured in A process are stored. These products are received as parts of (40) individuals in C process.

[0079] T17 : The box b1 conveyed from B process is carried in to C process. In addition, in this box b1, 100 products manufactured in B process are stored. These products are received as parts of an individual (100) in C process.

[0080] T18 : In C process, 40 of 100 parts in all and the box b1 of 40 parts in a box a1 are used, and the product of <40> individuals is manufactured. In addition, the manufactured product is stored in a box c1.

[0081] T19 : A box c1 is taken out from C process. In addition, in this box c1, the product [40] individual manufactured in C process is stored.

[0082] T20 : A box d1 is taken out from D process. In addition, in this box d1, the product [100] individual manufactured in D process is stored.

[0083] T21 : The box a2 conveyed from A process is carried in to C process. In addition, in this box a2, 60 products manufactured in A process are stored. These products are received as parts of (60) individuals in C process.

[0084] T22 : In C process, all the 60 parts in a box a2 and all the 60 parts left behind in the box b1 are used, and the product of <60> individuals is manufactured. In addition, the manufactured product is stored in a box c2.

[0085] T23 : A box c2 is taken out from C process. In addition, in this box c2, the product [60] individual manufactured in C process is stored.

[0086] T24 : The box c1 conveyed from C process is carried in to F process. In addition, in this box c1, 40 products manufactured in C process are stored. These products are received as parts of (40) individuals in F process.

[0087] T25 : A box e1 is taken out from E process. In addition, in this box e1, the product [100] individual manufactured in E process is stored.

[0088] T26 : The box d1 conveyed from D process is carried in to F process. In addition, in this box d1, 100 products manufactured in D process are stored. These products are received as parts of an individual (100) in F process.

[0089] T27 : The box c2 conveyed from C process is carried in to F process. In addition, in this box c2, 60 products manufactured in C process are stored. These products are received as

parts of (60) individuals in F process.

[0090] T28 : The box e1 conveyed from E process is carried in to F process. In addition, in this box e1, 100 products manufactured in E process are stored. These products are received as parts of an individual (100) in F process.

[0091] T29 : In C process, 40 of 100 parts in all and the box d1 of 40 parts in a box c1 and 40 of 100 parts in a box e1 are used, and the product of <40> individuals is manufactured. In addition, the manufactured product is stored in a box f1.

[0092] Thus, if each goods (parts/product) move between each process in each process, each management data in a production control system will be updated corresponding to the flow of each [these] goods (parts/product). Therefore, an operator can know where corresponding goods (parts/product) exist in what state by investigating each management data.

[0093] Especially an operator can recognize the state of the taken-out product by management data investigation ***** in the product taking-out virtual warehouse of terminal 3A (the same is said of each terminals 3B-3F). That is, if the carrying-in time field of management data is a blank, an operator can recognize that the product corresponding to the management data concerned has not reached the following process yet. Moreover, if time is stored in the carrying-in time field of management data, an operator can recognize that the product corresponding to the management data concerned was carried in to this time in the following process.

[0094] Furthermore, an operator can recognize the state of the parts taken out from the last process by management data investigation ***** in the part warehousing virtual warehouse of terminal 3A (the same is said of each terminals 3B-3F). That is, if the carrying-in time field of management data is a blank, an operator can recognize that the parts corresponding to the management data concerned have not arrived yet. In this case, an operator can recognize that the parts corresponding to the time stored in the taking-out time field of the management data concerned were taken out from the last process. Moreover, if time is stored in the carrying-in time field of management data, an operator can recognize already in stock [corresponding parts] in the part warehousing warehouse of the process concerned.

[0095] Moreover, as a result of performing manufacture as mentioned above, in HDD13 of a server 1, each management data shown in drawing 10 will be stored. The history of processing of the goods corresponding to the management data concerned within each process and between each process is recorded on each [these] management data. Therefore, temporarily, when a defective is discovered in a certain process, a server 1 can pursue a defective based on each [these] management data. Hereafter, this defective trace processing is explained with reference to the flow chart of drawing 11 and drawing 12.

[0096] For example, an operator presupposes that it discovered that the defect had occurred for the product under present manufacture during manufacture of the product in a certain process. Furthermore, an operator presupposes that it checked that it was generated since the product manufactured in other processes of an upstream was used as parts one by one in the consecutive process rather than has this poor cause in the process under present manufacture. Here, an operator accesses a server 1 using nearby PC2, and directs a defective trace to this server 1. In addition, an operator notifies the process name which shows the process at which the defective was discovered, and the process name which shows the process of an upstream leading to poor generating to a server 1 using PC2 at this time.

[0097] CPU11 of a server 1 makes the processing shown in the flow chart of drawing 11 start in response to directions by the operator. Hereafter, it explains for every step of this drawing 11.

[0098] In S001, CPU11 of a server 1 acquires the process name which shows the contents of a notice sent by operator from PC2, i.e., the process at which the defective was discovered, and the process name which shows the process used as the poor cause.

[0099] In the following S002, CPU11 acquires the manufacture time about the product under present manufacture from the terminal 3 (A-F) arranged at the process at which the defective was discovered in the process concerned through a network.

[0100] In the following S003, CPU11 recognizes the connection relation between the process at which the defective was discovered, and the process of an upstream leading to defective generating with reference to the table showing the relation between each process.

- [0101] In the following S004, only one stage specifies one management data about the process of an upstream out of HDD13 of the self server 1 rather than the process at which CPU11 is the management data [time / this / time / use] based on the manufacture time acquired from the terminal 3 (A-F) in S002, and the defective was discovered.
- [0102] In the following S005, CPU11 confirms whether the process from which the process name of the specified management data caused defective generating is shown. And when the process name from which the process name caused defective generating is shown, CPU11 advances processing to S009. However, when the process from which the process name of the management data concerned caused defective generating is not shown, CPU11 performs loop processing of S006 or S008.
- [0103] Starting this loop processing, by S006 of the beginning, CPU11 acquires the manufacture time of the management data (when loop processing is 2nd henceforth) specified by S007 performed by loop processing of the management data (when loop processing is the first) specified by S004 or last time.
- [0104] In the following S007, CPU11 specifies one management data which made use time manufacture time when only one stage is the management data about an upstream process at, and was acquired from the process which the process name of the management data specified by these S007 in the management data specified by S004 or the last loop processing shows by S006 out of self HDD13.
- [0105] In the following S008, CPU11 confirms whether the process from which the process name of the management data specified in S007 caused defective generating is shown. And when the process from which this process name caused defective generating is not shown, CPU11 returns processing to S006.
- [0106] When it is judged that the process from which the process name of management data caused defective generating by S008 is shown as a result of repeating S006 of a more than or the loop of S008, CPU11 advances processing to S009 from S008.
- [0107] On the other hand, in S009, CPU11 acquires the use time of the management data specified in S004 or S007. In addition, two or more these use time may be given although one may be given. Then, CPU11 specifies each acquired use time as a key for reference, respectively.
- [0108] In the following S010, CPU11 advances defective trace processing for each [which was specified] use time of every, respectively. And CPU11 acquires a trace result for every use time, notifies it to an operator, and terminates processing.
- [0109] Hereafter, the defective trace processing sub routine performed in S010 of this drawing 11 is explained further in full detail. Drawing 12 is a flow chart which shows the processing about one certain use time of each specified use time. It explains for every step of this drawing 12.
- [0110] It is the management data which made manufacture time use time specified as a search key, and, as for CPU11, only one stage searches the management data about the process of a downstream with S101 within self HDD13 rather than the process at which the defective was discovered. When the corresponding management data is discovered as a result of this reference, CPU11 is treated with what specified the management data.
- [0111] In the following S102, CPU11 confirms whether the corresponding management data was specified as a result of the reference in S101. And when management data is specified, although CPU11 advances processing to S104, when that is not right, it advances processing to S103.
- [0112] In S103, it is judged that the defect had generated CPU11 for the product (or product corresponding to the management data specified in S101 performed before last time) corresponding to the management data already specified in S004 or S007 since management data was not specified as a result of reference just before being based on S101. And CPU11 makes a trace result the purport to which a defective exists in the product under present manufacture in the following process of the process which the process name of the management data concerned shows, and transmits this trace result to PC2. PC2 is notified to an operator by displaying this trace result on CRT etc. CPU11 ends this defective trace sub routine after this completion of S103.
- [0113] In S104, it is confirmed whether the management data as which CPU11 was specified by

reference by S101 has use time. And when had, CPU11 advances processing to S105. However, CPU11 advances processing to S106, when the management data concerned does not have use time.

[0114] In S105, CPU11 returns processing to S101, after specifying the use time of the management data specified in S101 as a search key.

[0115] In S106, it is confirmed whether the management data as which CPU11 was specified in S101 has carrying-in time. And when had, processing is advanced to S107. However, CPU11 advances processing to S108, when the management data concerned does not have carrying-in time.

[0116] In S107, CPU11 will be judged, if the defective is stored in the box which the box sign of the management data specified in S101 shows. Furthermore, since the management data concerned does not have use time and it has carrying-in time, the box which stored the defective will judge CPU11, if not used yet, although already carried in in the following process. And the defective is stored in the box which the box sign of the specified management data shows, this box makes a trace result the purport stored in the part warehousing warehouse in the following process of the process which the process name data of the specified management data show, and CPU11 transmits this trace result to PC2. PC2 is notified to an operator by displaying this trace result on CRT etc.

[0117] In S108, CPU11 will be judged, if the defective is stored in the box which the box sign of the specified management data shows. Furthermore, since the management data concerned does not have carrying-in time, CPU11 will judge the box which stored the defective, if the following process is not reached yet. And the defective is stored in the box which the box sign of the specified management data shows, this box makes a trace result the purport which is under conveyance to the following process of the process which the process name data of the specified management data show, and CPU11 transmits this trace result to PC2. PC2 is notified to an operator by displaying this trace result on CRT etc.

[0118] Thus, it explains more concretely hereafter about the defective trace processing carried out. Namely, it is premised on each management data shown in drawing 10 having been stored in HDD13 of a server 1 as a result of performing manufacture shown in drawing 9 like ****. Here, an operator presupposes that it discovered that the defect occurred for the product by which the manufacture start was carried out at F process at the time of T29 in drawing 9. Furthermore, an operator presupposes that it traced that this poor cause was in the product produced in B process. In this case, an operator accesses a server 1 using nearby PC2, and directs a defective trace to this server 1. At this time, the defect's having generated the operator for the product under present manufacture at F process to a server 1 through PC2 and the poor cause concerned notify originating in B process.

[0119] Then, a server 1 acquires this content of a notice (S001). Furthermore, a server 1 acquires the manufacture time "T29" about the product under manufacture from terminal 3F at a present F process (S002). And a server 1 investigates the connection relation between F process at which the defect was discovered, and B process which supplied the parts used as a cause with reference to the table showing the connection relation between each process (S003), and recognizes a connection relation called a B process → C process → F process.

[0120] And a server 1 searches the management data used as parts in the manufacture started at time "T29" in F process. That is, in each management data, the management data by which "C" was stored in the process name field while "T29" was stored in the use time field is specified (S004). Here, (C-1) of drawing 10 will be specified.

[0121] And a server 1 acquires the time when the product corresponding to the specified management data was manufactured after checking that the specified management data was not a thing corresponding to B process (S005) (S006). That is, "T18" stored in the manufacture time field in the management data of (C-1) of drawing 10 is acquired. Moreover, a server 1 searches and specifies the used parts, when the product corresponding to the management data of (C-1) of drawing 10 is manufactured. That is, a server 1 specifies the management data by which "B" was stored in the process name field while "T18" is stored in the use time field among each management data (S007). Here, the management data of (B) of drawing 10 is specified.

[0122] Since, as for the management data of (B) of this drawing 10, "B" is stored in the process name field, a server 1 recognizes that it is the management data corresponding to the parts with which this management data caused a defective (S008).

[0123] Here, a server 1 finishes the investigation to the upstream in the connection relation of each process, and starts the investigation to a downstream. First, the product corresponding to the management data of (B) of drawing 10 in a server 1 acquires the time used as parts in the following C process (S009). That is, a server 1 acquires "T18" stored in the use time field in the management data of (B) of drawing 10, and "T22." Thus, the product corresponding to (B) management data of drawing 10 is used in 2 steps in the following C process. Therefore, you have to investigate henceforth about the both sides of the manufacture started by "T18" in C process, and the manufacture started by "T22" in C process.

[0124] A server 1 searches and specifies the management data by which "T18" is stored in the manufacture time field while "C" is stored in the process name field among each management data about one "T18" (S101). Here, the management data of (C)-1 of drawing 10 will be specified. Furthermore, a server 1 acquires the time when the product corresponding to the management data of (C)-1 of this drawing 10 was used as parts in the following F process. That is, a server 1 acquires "T29" stored in the use time field in the management data of (C)-1 of drawing 10 (S105). However, as a result of searching the management data which makes this "T29" manufacture time (S101), a server 1 checks that there is no corresponding management data (S102), and recognizes that the defect has occurred about the manufacture of "T29" in the next F process of C process which is a process corresponding to the management data of (C)-1 of drawing 10.

[0125] A server 1 searches and specifies the management data by which "T22" is stored in the manufacture time field while "C" is stored in the process name field among each management data about "T22" of another side (S101). Here, the management data of (C)-2 of drawing 10 will be specified. Furthermore, a server 1 checks that the use time field of the management data of (C)-2 of this drawing 10 is a blank (S104). Moreover, a server 1 checks that the carrying-in time of the management data of (C)-2 of drawing 10 is not a blank (S106). Already, although the product corresponding to the management data of (C)-2 of drawing 10 in a server 1 was carried in to F process as parts by this, by it, it recognizes not being used in F process yet.

[0126] That is, a server will judge the parts corresponding to the management data of (C)-2 of drawing 10, if stored in the part warehousing warehouse of F process. Furthermore, a server 1 acquires "c2" stored in the box sign field in the management data of (C)-2 of this drawing 10.

[0127] And a server 1 displays a defective trace result on CRT of an operator's nearby PC2 etc. that is, the purport which is a product under manufacture displays the goods (parts/product) with which the parts used as the poor cause were incorporated in a present F process — having (S103) — the purport which are the parts in the box c2 with which the goods (parts/product) with which the parts used as the poor cause were incorporated were stored in the part warehousing warehouse of F process is displayed (S107) — it is. An operator can recognize that the defect had occurred in response to this defective trace result also on the parts in the box c2 the defect not only has occurred, but stored in the product under manufacture in the present F process in the part warehousing warehouse of F process.

[0128] when a defective was generally discovered in the product manufactured in a certain process, it was manufactured simultaneously — the same — possibility that the same defect has occurred for many of product of LOT, i.e., each products stored in the same box, is high. Therefore, you have to pursue all the whereabouts of the product manufactured simultaneously. However, as mentioned above, it is also a certain reason that the product concerned is used for multiple times, dividing in the following process. Thus, if this production control system is applied to the production process group to which two or more processes were connected, the operator can pursue certainly all the goods (parts/product) with which the parts used as the poor cause were used.

[0129] Therefore, the operator can remove certainly only the goods (parts/product) with which the parts used as the poor cause were used, without removing all of each part article in all processes, and each product, or reinspecting them.

[0130] In addition, combination of data with the parts carried in from the outside of this system should just input the part number or a lot number instead of the manufacture time of the part. What is necessary is just to input a part number or a lot number instead of use time, when a product is taken out of a system.

[0131] [Modification 1] With the above-mentioned operation form, the time when manufacture was started was to be stored in the manufacture time field of management data. Instead, it is good also as a manufacture finish time being stored in this manufacture time field. Moreover, it is good also as the both sides of a manufacture start time and a manufacture finish time being stored in this manufacture time field.

[0132] [Modification 2] Management data was equipped with the taking-out time field, the carrying-in time field, the process name field, the box sign field, the manufacture time field, and the use time field with the above-mentioned operation gestalt. Furthermore, this management data is good also as having the incidental information field for storing the information on other.

[0133] And it is good for this incidental information field also as, for example, information, such as quantity of the manufactured product, quantity of the product completed correctly, quantity of a defective, and a percent defective, being stored.

[0134] Moreover, the information on average time (lead time) until the product taken out from the process which the process name field of the management data concerned shows, for example is carried in as parts in the following process is good for this incidental information field also as being stored.

[0135] By referring to the information in this attendant-circumstances field, an operator can know the grade of poor generating in each process, and the time taken to move between each process, and can perform a suitable production control, such as adjusting the number of manufactures of the product in each process.

[0136]

[Effect of the Invention] According to the production control system of this invention constituted as mentioned above, the history of the processing can be investigated simple by using as a key time when the processing concerned was performed about the goods processed while moving between the inside of each process, and each process.

[Translation done.]

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TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to the production control system which manages each process in the work which consists of two or more processes connected mutually.

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PRIOR ART

[Description of the Prior Art] Generally, the product manufactured with various production facilities is constituted by two or more parts. These each part article will be manufactured as a product in other production facilities, if it goes back. here, if it becomes, a final product will be obtained for the first time by [which call process the functional unit which receives parts and manufactures a product] connecting each [these] process in predetermined sequence — it divides and comes out

[0003] Therefore, either of each process of the upstream which the cause of poor generating may be in the process concerned, and supplied parts into the product which should have been manufactured in a certain process at the process concerned when it was discovered that the defective had occurred may be related to generating of a defective.

[0004] Now and temporarily, it is discovered that the defective had occurred in the product manufactured in a certain process, and it presupposes further that it was checked that the parts manufactured in the process with an upstream were the causes of generating of this defective. In such a case, the parts used as the problem may exist in each stage of each process. Therefore, an operator interrupts manufacture of a product, in each process with the misgiving related to poor generating, he has to remove all of the parts and product which exist in each stage of each [these] process, has to reinspect, or there must be.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] When a defective is discovered, in order to remove the defective concerned from between the inside of each process, and each process according to the above-mentioned conventional technology, there was a problem [say / that great time and a great effort are applied].

[0006] Usually, a poor cause exists only in the limited time set at a certain process. for this reason, when the defective had been manufactured, in the process concerned, it was manufactured simultaneously — the same — only each part article of LOT is a defective by high probability Therefore, it is desirable to remove only all the parts concerned of LOT. However, since as parts or this part of LOT is already incorporated as a product in many consecutive processes, the operator is unable to specify all the things concerning the LOT concerned from the parts in each process, and a product as a matter of fact.

[0007] of course, the same — an operator can also manage the flow of the parts within each process and between each process to all the parts manufactured as LOT by giving the stamp which shows the LOT concerned However, considering the initial cost of the marking press, and the cost concerning the employment, the product finally manufactured will become expensive.

[0008] Then, a process is managed simple, without using an expensive device, and let it be the technical problem of this invention to offer the production control system which can be pursued certainly for a defective.

[Translation done.]

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MEANS

[Means for Solving the Problem] In this invention, in order to solve the above-mentioned technical problem, the following composition was adopted.

[0010] Namely, the production control system of this invention is a production control system which manages each process which outputs the goods obtained by processing while processing the goods outputted as an output object from the last process as an input object, respectively to the following process as an output object. two or more time checks which acquire the processing time to the input object in each aforementioned process — with a means the above — each — a time check — it connecting with a means, respectively and the 1st processing time which is the processing time in the process which shows the process name which shows each process uniquely, and this process name, and the 2nd processing time which is the processing time in the following process over the output object from the process concerned It is characterized by having a storage means to memorize as management data of a lot.

[0011] In addition, where more than one are summarized, the aforementioned goods are received as an input object in the following process while they are outputted as an output object, and they are good in this following process also as arbitrary things which quantity extraction is carried out and are processed. and between each process which corresponds to the aforementioned goods in the state where two or more aforementioned management data were gathered, and adjoins each other — setting — unique — oneself and others — it is good also as having further the local identifier to which the aforementioned goods which move between each process which adjoins each other were made to correspond while it was identifiable Furthermore, two or more goods may be dealt with in the state where it was stored in the storing inside of the body of a box and others. moreover — this box — oneself and others, such as a box sign, i.e., a bar code, a sign, or an image, — the identifiable local identifier is attached and its peach is good

[0012] Moreover, when the cause process of the upstream which went back the process concerned while the output object by which the control means of the aforementioned production control system were processed at predetermined processing time in the predetermined process was specified is specified, The 1st processing time of the management data which specified the management data which makes the aforementioned predetermined processing time the 2nd processing time among the management data which have the process name which shows the last process of the aforementioned predetermined process, and was specified immediately before is acquired. It is good also as repeating until it specifies management data including the process name which shows the aforementioned cause process for the processing which newly specifies the management data which contains the 1st processing time acquired while including the process name which shows the last process of the process which the process name of the management data concerned shows as 2nd processing time.

[0013] Furthermore, it is good also as acquiring the local identifier contained in the management data which repeated the processing which newly specifies the management data which contains the processing time of the above 2nd of the aforementioned management data as 1st processing time while including the process name which shows the following process of the process which the process name of the management data which these control means specified management data including the process name which shows the aforementioned cause process, and was

specified immediately before shows, and was finally specified.

[0014] For example, the output object of a certain process is a defective, and when it is in the output object with which this poor cause was outputted from the upstream process (cause process), the control means of a production control system can pursue all the output objects used as the cause.

[0015] In addition, each above-mentioned process may be a manufacturing process which carries in the product (output object) taken out from the last process as parts (input object), manufactures a product using this part, and takes out the obtained product to the following process. and the product manufactured in a certain process at the period is the same — it is good also as being dealt with in the state where it was collected as LOT Moreover, in each process, the product carried in where more than one are summarized may be used, dividing into multiple times, after being divided into arbitrary quantity. Moreover, each above-mentioned process may be a process on the physical distribution which conveys goods, and a process on goods sale.

[0016] In addition, processing time may be the time when processing was started, may be the time which processing ended, and may be the both sides of the time when processing was started, and the ended time. moreover, each process — the time check to kick — a means interlocks with [the production facility in each process] and is automatic — it is good also as being able to clock and clocking based on directions of an operator

[0017]

[Embodiments of the Invention] the following and a drawing — being based — 1 operation gestalt ***** explanation of this invention — it carries out The production control system by this operation gestalt is for managing the whole production process group which consists of two or more processes. First, this “process” is explained. A process here is a predetermined batch in production, and it has the function to manufacture a product using the received parts. That is, a process is a functional unit realized by the operator who performs a production activity using the various warehouses which store various production facilities, and parts and products, such as a machine tool installed in the predetermined field in production facilities, such as works, and these production facilities and a warehouse.

[0018] Moreover, each of these processes are connected in predetermined sequence. And each process manufactures a product using the parts taken out from the last process, and takes out the obtained product to the following process. In addition, parts/product is dealt with per LOT. That is, in a box (storing object), parts/product will be dealt with, where [of 50 pieces or 300 pieces / which was settled] quantity storing is carried out. Moreover, the unique box sign (local identifier) for distinguishing the box of this ** from other boxes is given to each box. More specifically, the bar code which shows the box sign of the box is stuck on the front face of each box.

[0019] The various warehouses in each above-mentioned process consist of a part warehousing warehouse, a part use warehouse, a product completion warehouse, and a product taking-out warehouse. Hereafter, drawing 1 is referred to and movement of the parts/product between each warehouse within a process is explained.

[0020] First, if the box with which parts were stored in a certain process arrives, an operator will store this box in a part warehousing warehouse, and will keep it. And in case manufacture is started, an operator chooses a required thing among the boxes stored in the part warehousing warehouse, and moves to a part use warehouse. The parts in the box with which the operator was moreover moved to this part use warehouse are used, and a product is manufactured. In addition, the completed product is stored one by one in a box other than the box in which parts were stored. After manufacture is completed, an operator stores the box with which the product was stored into a product completion warehouse, and keeps it. And in the case of product shipment, an operator chooses a required thing among the boxes stored in the product completion warehouse, and moves to a product taking-out warehouse. In addition, the box moved to the product taking-out warehouse is immediately taken out towards the following process.

[0021] The final product used as the purpose is produced by connecting such each process in predetermined sequence. Drawing 2 is the ** type view showing the connection relation between

each process. In addition, six processes in two or more processes, i.e., A process, B process, C process, D process, E process, and F process are typically shown in this drawing 2.

[0022] In this drawing 2, C process receives the product (output object) completed in B process as parts (input object) in the C process concerned while receiving the product (output object) completed in A process as parts (input object) in the C process concerned. Furthermore, process assembly, processing, etc. to the received parts, it is made to complete as a product in the C process concerned, and C process is sent to F process by using this product as an output object.

[0023] And F process receives the product by D process as parts, and receives the product by E process as parts while it receives the product by C process as parts. Furthermore, F process completes a product with the received parts. In addition, the product by this F process is also the final product of the whole production process group.

[0024] Next, the composition of a production control system for managing each process in an above-mentioned production process group is explained. Drawing 3 is the block diagram showing the production control system by this operation gestalt. This production control system has a server 1, two or more personal computers (Following PC and brief sketch) 2 connected to this server 1 through the network, respectively, and two or more terminals 3A-3F connected to each PC2, respectively. In addition, each terminals 3A, 3B, and 3C, 3D, and 3E and 3F are made to correspond to each process, i.e., A process, B process, C process, D process, E process, and F process, respectively, and they are arranged.

[0025] Drawing 4 is the block diagram showing a server 1. As shown in this drawing 4, a server 1 has CPU11, RAM12 and HDD13 which were mutually connected by bus, the communications control circuit 14, the display-control circuit 15, and the input-control circuit 16. Furthermore, a server 1 has CRT17 connected to the display-control circuit 15, and the keyboard 18 connected to the input-control circuit 16. Moreover, the server 1 is connected to the network by the communications control circuit 14.

[0026] Various programs, such as an operating system and a database program, are beforehand memorized by HDD13. Moreover, the table showing the connection relation between each process shown in drawing 2 is beforehand memorized by this HDD13.

[0027] CPU11 reads the program stored in this HDD13, and it is made to perform it, after developing the predetermined field of RAM12. And CPU11 can make required information transmit to an operator by controlling the display-control circuit 15 and carrying out a screen display of the picture to CRT17. And if an operator performs alter operation to a keyboard 18, CPU11 can detect the alter operation concerned through the input-control circuit 16. Although explained later, when a defect occurs for the manufactured product, an operator can direct a defective trace to a server 1.

[0028] in addition, each PC2 — the above-mentioned server 1 and abbreviation — it is the same composition and connects with this server 1 through the network, respectively And two or more terminals 3A-3F are connected to each PC2 through the network, respectively. Drawing 5 is explanatory drawing showing the composition of terminal 3A. In addition, each of other terminals 3B-3F have the same composition as this terminal 3A, respectively. As shown in this drawing 5, terminal 3A has a programmable logic controller (it is described as Following PLC) 31, display-input equipment 32, and a bar code reader 33.

[0029] PLC31 has CPU311, ROM312 and RAM313 which were mutually connected by bus, the communications control circuit 314, the input-control circuit 315, and the display-control circuit 316. moreover, CPU311 — a time check — the clock M as a means is built in and time (at a year, the moon, a day, the time a part, a second) can be acquired by this clock M In ROM312, various programs, such as a database program, are memorized beforehand. RAM313 has a field for performing the program memorized by ROM312, and the field used as each virtual warehouse mentioned later.

[0030] In addition, each [these] virtual warehouse, i.e., a part warehousing virtual warehouse, the part use virtual warehouse, the product completion virtual warehouse, and the product taking-out virtual warehouse are typically shown in drawing 5. Although explained later Each virtual warehouse (carrying-in virtual warehouse section), i.e., a part warehousing virtual

warehouse, a part use virtual warehouse (use virtual warehouse section), A product completion virtual warehouse (completion virtual warehouse section) and a product taking-out virtual warehouse (taking-out virtual warehouse section) make each warehouse within an actual process, i.e., the part warehousing warehouse shown in drawing 1, a part use warehouse, a product completion warehouse, and a product taking-out warehouse correspond, respectively, and are prepared on RAM313.

[0031] Display-input equipment 32 has a touch panel 321 and a liquid crystal panel (it is described as Following LCD) 322. A touch panel 321 is connected to the input-control circuit 315 of PLC31 while it is arranged on the screen of LCD322. Moreover, LCD322 is connected to the display-control circuit 316 of PLC31. The bar code reader 33 as a reading means can read a bar code while connecting with the input-control circuit 315 of PLC31. That is, this bar code reader 33 is used in order to make the bar code as a local identifier given to the box which stored parts/product read.

[0032] And the predetermined field of RAM313 is developed and CPU311 of PLC31 performs the program stored in ROM312. Moreover, CPU311 of PLC31 controls the display-control circuit 316, and displays a picture on LCD322 of display-input equipment 32. In this picture, two or more button, i.e., carrying-in button, use buttons, manufacture start buttons, manufacture end buttons, and taking-out buttons are contained.

[0033] An operator can perform alter operation by pushing each button displayed on LCD322. That is, the touch panel 321 arranged on the screen of LCD322 can detect the position on the screen pushed by the operator, and can transmit the signal which shows this position to the input-control circuit 315 of PLC31. And while CPU311 detects the position on the screen pushed by the operator through this input-control circuit 315, this position can recognize with which button on a screen it has lapped.

[0034] Moreover, when an operator makes a bar code read by the bar code reader 33, this bar code reader 33 acquires the bar code data corresponding to the bar code concerned, and transmits to the input-control circuit 315 of PLC31. CPU311 of PLC31 can acquire bar code data through this input-control circuit 315.

[0035] Thus, each constituted terminals 3A-3F are connected to the network through the communications control circuit 314.

[0036] In addition, CPU11 of a server 1 and CPU311 of Terminals 3A-3F are equivalent to control means. Moreover, RAM12 and HDD13 of a server 1, and RAM313 of Terminals 3A-3F are equivalent to a storage means.

[0037] Next, the correspondence relation between the flow of the parts/product in each actual process and the flow of data processing in a production control system is explained. In addition, parts/product is dealt with in the state of some quantity conclusion **** as mentioned above (stored in a box).

[0038] The production control system is making the management data of one unit correspond in this way for every part / product of a certain quantity conclusion **** state. In addition, each management data is processed by the database program in a server 1, and the database program in each terminals 3A-3F. Moreover, although explained later, each management data has each field of "taking-out time", "carrying-in time", a "process name", a "box sign", "manufacture time", and "use time." And if goods (parts/product) move between each process in each process, corresponding management data will be updated in a production control system in the state of having been in agreement with the flow of these goods (parts/product).

[0039] For example, if its attention is paid to C process in drawing 2, while receiving like **** the product shipped from A process as parts in the C process concerned at this C process, the product shipped from B process will be received as parts in the C process concerned. Here, the product manufactured in A process is taken out to C process in the state where it was stored in the box to which the predetermined box sign (a1, a2, a3, —) was given. in addition, suppose hereafter that the thing of the box to which the box sign "a1" was given is written as "a box a1" (others — it writes similarly about the box to which the box sign was given)

[0040] Terminal 3A transmits the management data corresponding to the time of product taking out from this A process to a server 1 and terminal 3C. Drawing 6 shows this management data

typically. in addition, the content is updated one by one and this management data is ** as processing progresses And (I) of drawing 6 shows the state of the management data at the time of a box a1 being taken out from A process.

[0041] Here, (I) of this drawing 6 is taken for an example, and each field in management data is explained. The process name field is the field for storing the process name by which the product corresponding to the management data concerned was manufactured. "A" which shows A process is stored in the process name field in (I) of drawing 6.

[0042] The taking-out time field is the field for storing the time (taking-out time) when the product was taken out from the process (A process in this case) which the process name stored in the process name field shows. "T11" is stored in the taking-out time field in (I) of drawing 6.

[0043] The carrying-in time field is the field for the product taken out in this way storing the time (carrying-in time as carrying-in information) carried in as parts in the next process (C process in this case) of the process concerned. In addition, since (I) of drawing 6 still shows the management data at the time of carrying in [in / the following C process / taking out from A process was just performed, and] not being made, this carrying-in time field serves as a blank.

[0044] The box sign field is the field for storing the box sign of the box with which the completed product was held. "a1" is stored in the box sign field in (I) of drawing 6.

[0045] The manufacture time field is the field for storing the time (manufacture time) when manufacture of a product was started. This manufacture time is equivalent to the 1st processing time. "T10" is stored in the manufacture time field in (I) of drawing 6.

[0046] In the following process (C process in this case) of a process that the product was manufactured, the use time field is the field for storing the time (it being called use time since it is used as parts) when this manufacture is started, in case this product is used as parts and manufacture is performed. This use time is equivalent to the 2nd processing time. In addition, in (I) of drawing 6, since the product by A process is not used as parts in the following C process yet, this use time field is a blank.

[0047] If the management data ((I) of drawing 6) of such composition is transmitted from terminal 3A, a server 1 will receive and hold this management data. Moreover, terminal 3C receives this management data, and stores it in the part warehousing virtual warehouse. In addition, the actual thing (the product in A process, i.e., the parts in C process) which corresponds at this time has not reached C process yet. This is checked when the carrying-in time field of the management data concerned is a blank.

[0048] An operator makes the bar code of a box a1 read by the bar code reader 33 soon, if a box a1 reaches C process while directing carrying-in processing by carrying out the depression of the carrying-in button of the display-input equipment 32 to terminal 3C. Then, terminal 3C acquires time "T16" as carrying-in time by the clock M while acquiring the bar code data in which a box sign "a1" is shown. And terminal 3C searches and specifies the management data by which "a1" was stored in the box sign field among the management data stored in the part warehousing virtual warehouse. Carrying-in time "T16" is stored in the carrying-in time field of management data where terminal 3C was moreover specified. Thus, the updated management data is shown in (II) of drawing 6.

[0049] Simultaneously, terminal 3C sets a box sign "a1" and carrying-in time "T16" as a carrying-in signal, and transmits this carrying-in signal to a server 1 and terminal 3A. A server 1 receives this carrying-in signal, and acquires the box sign "a1" and carrying-in time "T16." And the carrying-in time field is a blank among the management data currently held, and a server 1 searches and specifies the management data by which "a1" was stored in the box sign field. Carrying-in time "T16" is stored in the carrying-in time field of management data where the server 1 was moreover specified. On the other hand, terminal 3A also receives a carrying-in signal, and updates the management data which corresponds similarly.

[0050] In addition, the box a1 carried in to C process in this way is kept after the reading processing by the bar code reader 33 of terminal 3C, and in a part warehousing warehouse. Moreover, in C process, the goods in this box a1, i.e., the product in A process, will be dealt with as parts.

[0051] As mentioned above, corresponding to the flow of the goods from A process to C

process, the management data in a production control system is updated. Similarly, corresponding to the flow of the goods from B process to C process, the management data in a production control system is updated. Drawing 7 shows this management data typically. That is, when the product manufactured in B process is taken out towards C process in the state where it was stored in the box b1, the corresponding management data in terminal 3B is transmitted towards a server 1 and terminal 3C. As this management data is shown in (I) of drawing 7, each of the carrying-in time fields and use time fields is blanks. A server 1 receives and holds the management data ((I) of drawing 7) transmitted from terminal 3B. Moreover, terminal 3C receives this management data, and stores it in the part warehousing virtual warehouse.

[0052] An operator makes the bar code of a box b1 read by the bar code reader 33 soon, if a box b1 reaches C process while directing carrying-in processing by carrying out the depression of the carrying-in button of the display-input equipment 32 to terminal 3C. Then, terminal 3C acquires time "T17" as carrying-in time by the clock M while acquiring the bar code data in which a box sign "b1" is shown. And terminal 3C specifies the management data by which "b1" was stored in the box sign field among the management data stored in the part warehousing virtual warehouse. Carrying-in time "T17" is stored in the carrying-in time field of management data where terminal 3C was moreover specified. Thus, the updated management data is shown in (II) of drawing 7.

[0053] Simultaneously, terminal 3C sets a box sign "b1" and carrying-in time "T17" as a carrying-in signal, and transmits this carrying-in signal to a server 1 and terminal 3B. A server 1 receives a carrying-in signal and acquires the box sign "b1" and carrying-in time "T17." And the carrying-in time field is a blank among the management data currently held, and a server 1 specifies the management data by which "b1" was stored in the box sign field. Carrying-in time "T17" is stored in the carrying-in time field of management data where the server 1 was moreover specified. On the other hand, terminal 3B also receives a carrying-in signal, and updates the management data which corresponds similarly.

[0054] In addition, the box b1 carried in to C process in this way is kept after the reading processing by the bar code reader 33 of terminal 3C, and in a part warehousing warehouse. Moreover, in C process, the goods in this box b1, i.e., the product in B process, will be dealt with as parts.

[0055] And at C process, the product in the C process concerned is manufactured with the parts from A process carried in like the above, and the parts from B process. That is, the parts from A process are carried in to the part warehousing warehouse of C process in the state where it was stored in the box a1. Moreover, the parts from B process are carried in to the part warehousing warehouse of C process in the state where it was stored in the box b1. In addition, these parts are kept in the part warehousing warehouse until manufacture is started.

[0056] And in case an operator starts manufacture, he moves the box a1 and box b1 which were stored in the part warehousing warehouse to a part use warehouse. Simultaneously, an operator directs part use processing to terminal 3C by carrying out the depression of the use button of the display-input equipment 32. Then, terminal 3C displays all the management data stored in the part use virtual warehouse on the display operating set 32. An operator chooses the management data shown in (II) of drawing 6, and the management data shown in (II) of drawing 7 from the displayed management data. Then, terminal 3C moves both selected management data to a part use virtual warehouse from the part warehousing virtual warehouse.

[0057] Furthermore, an operator notifies a manufacture start to terminal 3C by carrying out the depression of the manufacture start button of the display-input equipment 32. Then, terminal 3C acquires the time "T18" of a manufacture start by the clock M. And terminal 3C specifies the management data from which the use time field became a blank among the management data in a part use virtual warehouse. "T18" is stored in the use time field of management data where terminal 3C was moreover specified.

[0058] Moreover, terminal 3C sets a box sign "a1" and time "T18" as an used signal, and transmits to a server 1 and terminal 3A. Simultaneously, terminal 3C sets a box sign "b1" and time "T18" as an used signal, and transmits to a server 1 and terminal 3B. That is, two used signals are transmitted from terminal 3C. Then, although a server 1 receives both the use signal,

terminal 3A will receive only one used signal, and terminal 3B will receive only the used signal of another side.

[0059] And a server 1 acquires the box sign "a1" and use time "T18" based on one used signal. And the use time field is a blank among the management data currently held, and a server 1 searches and specifies the management data by which "a1" was stored in the box sign field. Use time "T18" is stored in the use time field of management data where the server 1 was moreover specified. Moreover, the management data to which terminal 3A corresponds similarly based on this used signal is updated. Thus, the updated management data is shown in (III) of drawing 6.

[0060] Furthermore, a server 1 acquires the box sign "b1" and use time "T18" based on the used signal of another side. And the use time field is a blank among the management data currently held, and a server 1 searches and specifies the management data by which "b1" was stored in the box sign field. Use time "T18" is stored in the use time field of management data where the server 1 was moreover specified. Moreover, the management data to which terminal 3B corresponds similarly based on this used signal is updated. Thus, the updated management data is shown in (III) of drawing 7.

[0061] In addition, the product manufactured in A process and B process is supplied to C process as parts, and "is used" for the manufacture in the C process concerned. For this reason, the manufacture time "T18" of the product in C process is equivalent to the C process concerned for A process which supplied parts, and B process at use time.

[0062] And an operator prepares the box c1 for storing the product in the C process concerned, and makes the bar code read by the bar code reader 33 of terminal 3C. Then, terminal 3C will acquire a box sign "c1" from the acquired bar code data 33. The parts with which the operator was moreover stored in the box a1, and the parts stored in the box b1 are used, and a product is manufactured. In addition, the product completed as a result of manufacture is stored in the box of a box sign "c1."

[0063] After manufacture is completed, an operator moves the product in the state where the amount storing of predetermined numbers was carried out into the box c1 to a product completion warehouse. Simultaneously, an operator notifies a manufacture end to terminal 3C by carrying out the depression of the manufacture end button of the display-input equipment 32. Then, terminal 3C creates the management data to which the product stored in the box c1 was made to correspond, and stores it in a product completion virtual warehouse. (I) of drawing 8 shows the management data of this state. As for this management data, the taking-out time field, the carrying-in time field, and use time field are a blank. Moreover, "C" which shows C process is stored in the process name field, and "c1" is stored in the box sign field, and "T18" which is the time of a manufacture start is stored in the manufacture time field.

[0064] Thus, the manufactured product is stored in the product completion warehouse until it is taken out to the following process. And the management data corresponding to this product also remains stored in a product completion virtual warehouse.

[0065] In addition, as for the management data shown in (III) of drawing 6, and the management data shown in (III) of drawing 7, "T18" is stored in the use time field, respectively. This is because the parts corresponding to both management data were simultaneously used in C process. However, for example, the part quantity in a box a1 is 40, and suppose that the part quantity in a box b1 was 100. Supposing one product is now manufactured by using every one part of both in C process, the quantity of the product which can be manufactured will be limited to 40 pieces using the parts in a box a1, and the parts in a box b1. Therefore, 60 pieces which remained without being used among the parts in a box b1 will be used for next manufacture.

[0066] And supposing next manufacture is started at time "T22", "T22" will be further added to the use time field, and the management data shown in (III) of drawing 7 will be updated by the state by which it is shown in (IV) of drawing 7. Thus, the use time field can hold two or more use time.

[0067] As mentioned above, when conveying the product which manufacture was completed and was saved in the product completion warehouse, an operator moves the product stored in this product completion warehouse to a product taking-out warehouse. In addition, the product moved to this product taking-out warehouse will be shipped immediately.

[0068] Simultaneously, an operator directs taking-out processing of a product to terminal 3C by carrying out the depression of the taking-out button of the display-input equipment 32. Then, terminal 3C displays each management data in a product completion virtual warehouse on the display operating set 32. An operator chooses the management data which operated the display-input equipment 32 and was shown in (I) of drawing 8 to terminal 3C. Then, terminal 3C acquires time (taking-out time) "T19" by the clock M, and stores T19 in the taking-out time field of selected management data. Moreover, terminal 3C moves this selected management data to a product taking-out virtual warehouse from a product completion virtual warehouse. The management data moved to the product taking-out virtual warehouse is shown in (II) of drawing 8.

[0069] Furthermore, terminal 3C copies this management data ((II) of drawing 8), and transmits to a server 1 and terminal 3F. A server 1 receives and holds this management data. Moreover, terminal 3F receive this management data, and store it in the part warehousing virtual warehouse.

[0070] Thus, it turns out that each management data in a production control system is equivalent to the flow of each goods within each process and between each process (parts/product).

[0071] Hereafter, an operation of this operation form is explained. First, an example of the flow of the parts/product between each process is explained with reference to drawing 9. This drawing 9 is made to correspond to the manufacture in each process, taking out, and each processing of carrying in, and the time T10-T29 of the processing concerned is shown in it. Hereafter, it explains in order of the time series of this time T10-T29.

[0072] T10 : In A process, the product of <40> individuals is manufactured and it is stored in a box a1.

[0073] T11 : A box a1 is taken out from A process. In addition, in this box a1, the product [40] individual manufactured in A process is stored.

[0074] T12 : In B process, the product of <100> individuals is manufactured and it is stored in a box b1.

[0075] T13 : A box b1 is taken out from B process. In addition, in this box b1, the product [100] individual manufactured in B process is stored.

[0076] T14 : In A process, the product of <60> individuals is manufactured and it is stored in a box a2.

[0077] T15 : A box a2 is taken out from A process. In addition, in this box a2, the product [60] individual manufactured in A process is stored.

[0078] T16 : The box a1 conveyed from A process is carried in to C process. In addition, in this box a1, 40 products manufactured in A process are stored. These products are received as parts of (40) individuals in C process.

[0079] T17 : The box b1 conveyed from B process is carried in to C process. In addition, in this box b1, 100 products manufactured in B process are stored. These products are received as parts of an individual (100) in C process.

[0080] T18 : In C process, 40 of 100 parts in all and the box b1 of 40 parts in a box a1 are used, and the product of <40> individuals is manufactured. In addition, the manufactured product is stored in a box c1.

[0081] T19 : A box c1 is taken out from C process. In addition, in this box c1, the product [40] individual manufactured in C process is stored.

[0082] T20 : A box d1 is taken out from D process. In addition, in this box d1, the product [100] individual manufactured in D process is stored.

[0083] T21 : The box a2 conveyed from A process is carried in to C process. In addition, in this box a2, 60 products manufactured in A process are stored. These products are received as parts of (60) individuals in C process.

[0084] T22 : In C process, all the 60 parts in a box a2 and all the 60 parts left behind in the box b1 are used, and the product of <60> individuals is manufactured. In addition, the manufactured product is stored in a box c2.

[0085] T23 : A box c2 is taken out from C process. In addition, in this box c2, the product [60]

individual manufactured in C process is stored.

[0086] T24 : The box c1 conveyed from C process is carried in to F process. In addition, in this box c1, 40 products manufactured in C process are stored. These products are received as parts of (40) individuals in F process.

[0087] T25 : A box e1 is taken out from E process. In addition, in this box e1, the product [100] individual manufactured in E process is stored.

[0088] T26 : The box d1 conveyed from D process is carried in to F process. In addition, in this box d1, 100 products manufactured in D process are stored. These products are received as parts of an individual (100) in F process.

[0089] T27 : The box c2 conveyed from C process is carried in to F process. In addition, in this box c2, 60 products manufactured in C process are stored. These products are received as parts of (60) individuals in F process.

[0090] T28 : The box e1 conveyed from E process is carried in to F process. In addition, in this box e1, 100 products manufactured in E process are stored. These products are received as parts of an individual (100) in F process.

[0091] T29 : In C process, 40 of 100 parts in all and the box d1 of 40 parts in a box c1 and 40 of 100 parts in a box e1 are used, and the product of <40> individuals is manufactured. In addition, the manufactured product is stored in a box f1.

[0092] Thus, if each goods (parts/product) move between each process in each process, each management data in a production control system will be updated corresponding to the flow of each [these] goods (parts/product). Therefore, an operator can know where corresponding goods (parts/product) exist in what state by investigating each management data.

[0093] Especially an operator can recognize the state of the taken-out product by management data investigation ***** in the product taking-out virtual warehouse of terminal 3A (the same is said of each terminals 3B-3F). That is, if the carrying-in time field of management data is a blank, an operator can recognize that the product corresponding to the management data concerned has not reached the following process yet. Moreover, if time is stored in the carrying-in time field of management data, an operator can recognize that the product corresponding to the management data concerned was carried in to this time in the following process.

[0094] Furthermore, an operator can recognize the state of the parts taken out from the last process by management data investigation ***** in the part warehousing virtual warehouse of terminal 3A (the same is said of each terminals 3B-3F). That is, if the carrying-in time field of management data is a blank, an operator can recognize that the parts corresponding to the management data concerned have not arrived yet. In this case, an operator can recognize that the parts corresponding to the time stored in the taking-out time field of the management data concerned were taken out from the last process. Moreover, if time is stored in the carrying-in time field of management data, an operator can recognize already in stock [corresponding parts] in the part warehousing warehouse of the process concerned.

[0095] Moreover, as a result of performing manufacture as mentioned above, in HDD13 of a server 1, each management data shown in drawing 10 will be stored. The history of processing of the goods corresponding to the management data concerned within each process and between each process is recorded on each [these] management data. Therefore, temporarily, when a defective is discovered in a certain process, a server 1 can pursue a defective based on each [these] management data. Hereafter, this defective trace processing is explained with reference to the flow chart of drawing 11 and drawing 12.

[0096] For example, an operator presupposes that it discovered that the defect had occurred for the product under present manufacture during manufacture of the product in a certain process. Furthermore, an operator presupposes that it checked that it was generated since the product manufactured in other processes of an upstream was used as parts one by one in the consecutive process rather than has this poor cause in the process under present manufacture. Here, an operator accesses a server 1 using nearby PC2, and directs a defective trace to this server 1. In addition, an operator notifies the process name which shows the process at which the defective was discovered, and the process name which shows the process of an upstream leading to poor generating to a server 1 using PC2 at this time.

- [0097] CPU11 of a server 1 makes the processing shown in the flow chart of drawing 11 start in response to directions by the operator. Hereafter, it explains for every step of this drawing 11.
- [0098] In S001, CPU11 of a server 1 acquires the process name which shows the contents of a notice sent by operator from PC2, i.e., the process at which the defective was discovered, and the process name which shows the process used as the poor cause.
- [0099] In the following S002, CPU11 acquires the manufacture time about the product under present manufacture from the terminal 3 (A-F) arranged at the process at which the defective was discovered in the process concerned through a network.
- [0100] In the following S003, CPU11 recognizes the connection relation between the process at which the defective was discovered, and the process of an upstream leading to defective generating with reference to the table showing the relation between each process.
- [0101] In the following S004, only one stage specifies one management data about the process of an upstream out of HDD13 of the self server 1 rather than the process at which CPU11 is the management data [time / this / time / use] based on the manufacture time acquired from the terminal 3 (A-F) in S002, and the defective was discovered.
- [0102] In the following S005, CPU11 confirms whether the process from which the process name of the specified management data caused defective generating is shown. And when the process name from which the process name caused defective generating is shown, CPU11 advances processing to S009. However, when the process from which the process name of the management data concerned caused defective generating is not shown, CPU11 performs loop processing of S006 or S008.
- [0103] Starting this loop processing, by S006 of the beginning, CPU11 acquires the manufacture time of the management data (when loop processing is 2nd henceforth) specified by S007 performed by loop processing of the management data (when loop processing is the first) specified by S004 or last time.
- [0104] In the following S007, CPU11 specifies one management data which made use time manufacture time when only one stage is the management data about an upstream process at, and was acquired from the process which the process name of the management data specified by these S007 in the management data specified by S004 or the last loop processing shows by S006 out of self HDD13.
- [0105] In the following S008, CPU11 confirms whether the process from which the process name of the management data specified in S007 caused defective generating is shown. And when the process from which this process name caused defective generating is not shown, CPU11 returns processing to S006.
- [0106] When it is judged that the process from which the process name of management data caused defective generating by S008 is shown as a result of repeating S006 of a more than or the loop of S008, CPU11 advances processing to S009 from S008.
- [0107] On the other hand, in S009, CPU11 acquires the use time of the management data specified in S004 or S007. In addition, two or more these use time may be given although one may be given. Then, CPU11 specifies each acquired use time as a key for reference, respectively.
- [0108] In the following S010, CPU11 advances defective trace processing for each [which was specified] use time of every, respectively. And CPU11 acquires a trace result for every use time, notifies it to an operator, and terminates processing.
- [0109] Hereafter, the defective trace processing sub routine performed in S010 of this drawing 11 is explained further in full detail. Drawing 12 is a flow chart which shows the processing about one certain use time of each specified use time. It explains for every step of this drawing 12.
- [0110] It is the management data which made manufacture time use time specified as a search key, and, as for CPU11, only one stage searches the management data about the process of a downstream with S101 within self HDD13 rather than the process at which the defective was discovered. When the corresponding management data is discovered as a result of this reference, CPU11 is treated with what specified the management data.
- [0111] In the following S102, CPU11 confirms whether the corresponding management data was specified as a result of the reference in S101. And when management data is specified, although

CPU11 advances processing to S104, when that is not right, it advances processing to S103. [0112] In S103, it is judged that the defect had generated CPU11 for the product (or product corresponding to the management data specified in S101 performed before last time) corresponding to the management data already specified in S004 or S007 since management data was not specified as a result of reference just before being based on S101. And CPU11 makes a trace result the purport to which a defective exists in the product under present manufacture in the following process of the process which the process name of the management data concerned shows, and transmits this trace result to PC2. PC2 is notified to an operator by displaying this trace result on CRT etc. CPU11 ends this defective trace sub routine after this completion of S103.

[0113] In S104, it is confirmed whether the management data as which CPU11 was specified by reference by S101 has use time. And when had, CPU11 advances processing to S105. However, CPU11 advances processing to S106, when the management data concerned does not have use time.

[0114] In S105, CPU11 returns processing to S101, after specifying the use time of the management data specified in S101 as a search key.

[0115] In S106, it is confirmed whether the management data as which CPU11 was specified in S101 has carrying-in time. And when had, processing is advanced to S107. However, CPU11 advances processing to S108, when the management data concerned does not have carrying-in time.

[0116] In S107, CPU11 will be judged, if the defective is stored in the box which the box sign of the management data specified in S101 shows. Furthermore, since the management data concerned does not have use time and it has carrying-in time, the box which stored the defective will judge CPU11, if not used yet, although already carried in in the following process. And the defective is stored in the box which the box sign of the specified management data shows, this box makes a trace result the purport stored in the part warehousing warehouse in the following process of the process which the process name data of the specified management data show, and CPU11 transmits this trace result to PC2. PC2 is notified to an operator by displaying this trace result on CRT etc.

[0117] In S108, CPU11 will be judged, if the defective is stored in the box which the box sign of the specified management data shows. Furthermore, since the management data concerned does not have carrying-in time, CPU11 will judge the box which stored the defective, if the following process is not reached yet. And the defective is stored in the box which the box sign of the specified management data shows, this box makes a trace result the purport which is under conveyance to the following process of the process which the process name data of the specified management data show, and CPU11 transmits this trace result to PC2. PC2 is notified to an operator by displaying this trace result on CRT etc.

[0118] Thus, it explains more concretely hereafter about the defective trace processing carried out. Namely, it is premised on each management data shown in drawing 10 having been stored in HDD13 of a server 1 as a result of performing manufacture shown in drawing 9 like ****. Here, an operator presupposes that it discovered that the defect occurred for the product by which the manufacture start was carried out at F process at the time of T29 in drawing 9. Furthermore, an operator presupposes that it traced that this poor cause was in the product produced in B process. In this case, an operator accesses a server 1 using nearby PC2, and directs a defective trace to this server 1. At this time, the defect's having generated the operator for the product under present manufacture at F process to a server 1 through PC2 and the poor cause concerned notify originating in B process.

[0119] Then, a server 1 acquires this content of a notice (S001). Furthermore, a server 1 acquires the manufacture time "T29" about the product under manufacture from terminal 3F at a present F process (S002). And a server 1 investigates the connection relation between F process at which the defect was discovered, and B process which supplied the parts used as a cause with reference to the table showing the connection relation between each process (S003), and recognizes a connection relation called a B process →C process →F process.

[0120] And a server 1 searches the management data used as parts in the manufacture started

at time "T29" in F process. That is, in each management data, the management data by which "C" was stored in the process name field while "T29" was stored in the use time field is specified (S004). Here, (C-1) of drawing 10 will be specified.

[0121] And a server 1 acquires the time when the product corresponding to the specified management data was manufactured after checking that the specified management data was not a thing corresponding to B process (S005) (S006). That is, "T18" stored in the manufacture time field in the management data of (C-1) of drawing 10 is acquired. Moreover, a server 1 searches and specifies the used parts, when the product corresponding to the management data of (C-1) of drawing 10 is manufactured. That is, a server 1 specifies the management data by which "B" was stored in the process name field while "T18" is stored in the use time field among each management data (S007). Here, the management data of (B) of drawing 10 is specified.

[0122] Since, as for the management data of (B) of this drawing 10, "B" is stored in the process name field, a server 1 recognizes that it is the management data corresponding to the parts with which this management data caused a defective (S008).

[0123] Here, a server 1 finishes the investigation to the upstream in the connection relation of each process, and starts the investigation to a downstream. First, the product corresponding to the management data of (B) of drawing 10 in a server 1 acquires the time used as parts in the following C process (S009). That is, a server 1 acquires "T18" stored in the use time field in the management data of (B) of drawing 10, and "T22." Thus, the product corresponding to (B) management data of drawing 10 is used in 2 steps in the following C process. Therefore, you have to investigate henceforth about the both sides of the manufacture started by "T18" in C process, and the manufacture started by "T22" in C process.

[0124] A server 1 searches and specifies the management data by which "T18" is stored in the manufacture time field while "C" is stored in the process name field among each management data about one "T18" (S101). Here, the management data of (C)-1 of drawing 10 will be specified. Furthermore, a server 1 acquires the time when the product corresponding to the management data of (C)-1 of this drawing 10 was used as parts in the following F process. That is, a server 1 acquires "T29" stored in the use time field in the management data of (C)-1 of drawing 10 (S105). However, as a result of searching the management data which makes this "T29" manufacture time (S101), a server 1 checks that there is no corresponding management data (S102), and recognizes that the defect has occurred about the manufacture of "T29" in the next F process of C process which is a process corresponding to the management data of (C)-1 of drawing 10.

[0125] A server 1 searches and specifies the management data by which "T22" is stored in the manufacture time field while "C" is stored in the process name field among each management data about "T22" of another side (S101). Here, the management data of (C)-2 of drawing 10 will be specified. Furthermore, a server 1 checks that the use time field of the management data of (C)-2 of this drawing 10 is a blank (S104). Moreover, a server 1 checks that the carrying-in time of the management data of (C)-2 of drawing 10 is not a blank (S106). Already, although the product corresponding to the management data of (C)-2 of drawing 10 in a server 1 was carried in to F process as parts by this, by it, it recognizes not being used in F process yet.

[0126] That is, a server will judge the parts corresponding to the management data of (C)-2 of drawing 10, if stored in the part warehousing warehouse of F process. Furthermore, a server 1 acquires "c2" stored in the box sign field in the management data of (C)-2 of this drawing 10.

[0127] And a server 1 displays a defective trace result on CRT of an operator's nearby PC2 etc. that is, the purport which is a product under manufacture displays the goods (parts/product) with which the parts used as the poor cause were incorporated in a present F process — having (S103) — the purport which are the parts in the box c2 with which the goods (parts/product) with which the parts used as the poor cause were incorporated were stored in the part warehousing warehouse of F process is displayed (S107) — it is. An operator can recognize that the defect had occurred in response to this defective trace result also on the parts in the box c2 the defect not only has occurred, but stored in the product under manufacture in the present F process in the part warehousing warehouse of F process.

[0128] when a defective was generally discovered in the product manufactured in a certain

process, it was manufactured simultaneously — the same — possibility that the same defect has occurred for many of product of LOT, i.e., each products stored in the same box, is high. Therefore, you have to pursue all the whereabouts of the product manufactured simultaneously. However, as mentioned above, it is also a certain reason that the product concerned is used for multiple times, dividing in the following process. Thus, if this production control system is applied to the production process group to which two or more processes were connected, the operator can pursue certainly all the goods (parts/product) with which the parts used as the poor cause were used.

[0129] Therefore, the operator can remove certainly only the goods (parts/product) with which the parts used as the poor cause were used, without removing all of each part article in all processes, and each product, or reinspecting them.

[0130] In addition, combination of data with the parts carried in from the outside of this system should just input the part number or a lot number instead of the manufacture time of the part. What is necessary is just to input a part number or a lot number instead of use time, when a product is taken out out of a system.

[0131] [Modification 1] With the above-mentioned operation form, the time when manufacture was started was to be stored in the manufacture time field of management data. Instead, it is good also as a manufacture finish time being stored in this manufacture time field. Moreover, it is good also as the both sides of a manufacture start time and a manufacture finish time being stored in this manufacture time field.

[0132] [Modification 2] Management data was equipped with the taking-out time field, the carrying-in time field, the process name field, the box sign field, the manufacture time field, and the use time field with the above-mentioned operation form. Furthermore, this management data is good also as having the incidental information field for storing the information on other.

[0133] And it is good for this incidental information field also as, for example, information, such as quantity of the manufactured product, quantity of the product completed correctly, quantity of a defective, and a percent defective, being stored.

[0134] Moreover, the information on average time (lead time) until the product taken out from the process which the process name field of the management data concerned shows, for example is carried in as parts in the following process is good for this incidental information field also as being stored.

[0135] By referring to the information in this attendant-circumstances field, an operator can know the grade of poor generating in each process, and the time taken to move between each process, and can perform a suitable production control, such as adjusting the number of manufactures of the product in each process.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Explanatory drawing showing movement of the parts/product between each warehouse within a process

[Drawing 2] The ** type view showing the connection relation between each process

[Drawing 3] The block diagram showing the production control system by 1 operation gestalt of this invention

[Drawing 4] The block diagram showing the server of the production control system by 1 operation gestalt of this invention

[Drawing 5] The block diagram showing the terminal of the production control system by 1 operation gestalt of this invention

[Drawing 6] Explanatory drawing showing renewal of the management data in A process

[Drawing 7] Explanatory drawing showing renewal of the management data in B process

[Drawing 8] Explanatory drawing showing renewal of the management data in C process

[Drawing 9] Explanatory drawing showing an example of the flow of the parts/product between each process

[Drawing 10] Explanatory drawing showing an example of the management data in a server

[Drawing 11] The flow chart which shows defective trace processing

[Drawing 12] The flow chart which shows defective trace processing

[Description of Notations]

1 Server

11 CPU

12 RAM

13 HDD

3A-3F Terminal

31 PLC

32 Display-Input Equipment

33 Bar Code Reader

M Clock

[Translation done.]

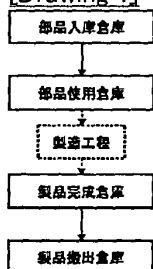
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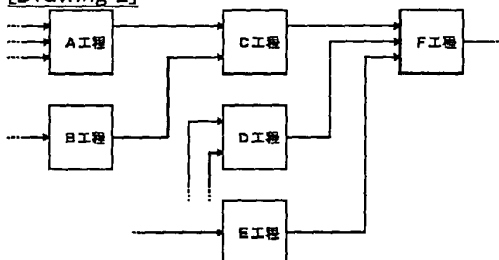
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DRAWINGS

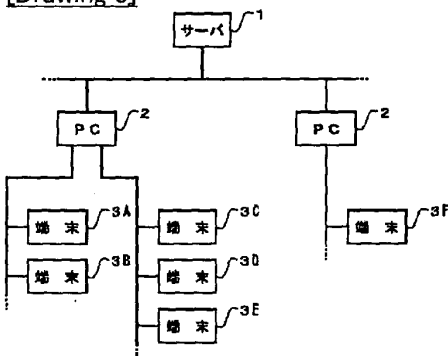
[Drawing 1]



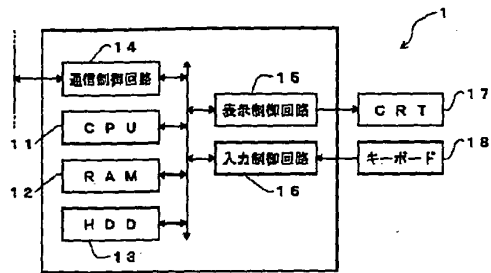
[Drawing 2]



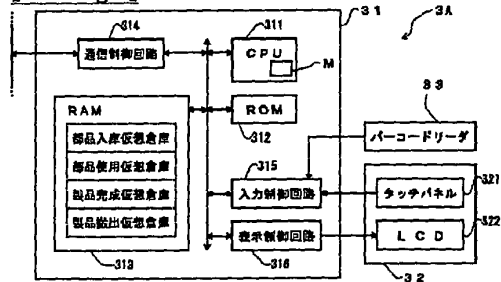
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Drawing 6]

(I)	搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
	T11		A	a 1	T10	

(II)	搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
	T11	T16	A	a 1	T10	

(III)	搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
	T11	T16	A	a 1	T10	T18

[Drawing 7]

(I)	搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
	T13		B	b 1	T12	

(II)	搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
	T13	T17	B	b 1	T12	

(III)	搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
	T13	T17	B	b 1	T12	T18

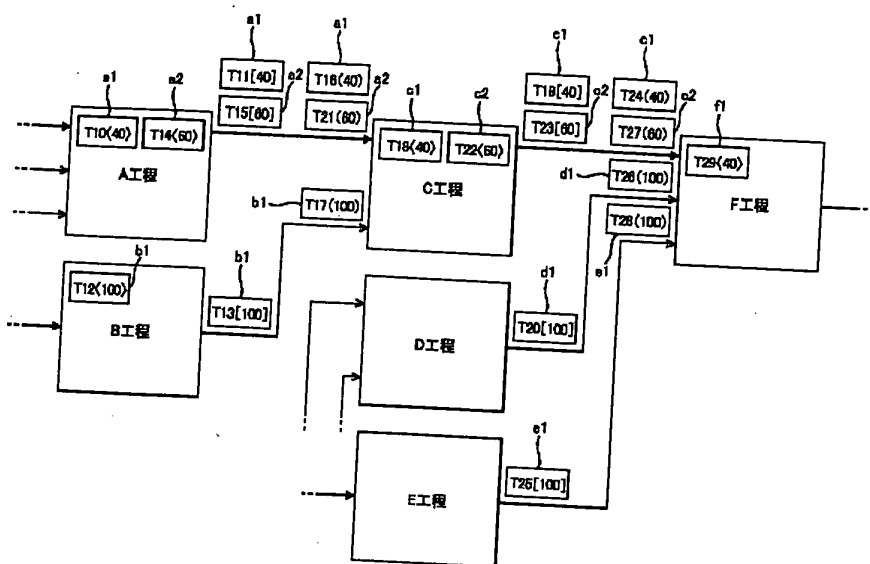
(IV)	搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
	T13	T17	B	b 1	T12	T18, T22

[Drawing 8]

(I)	搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
			C	c 1	T18	

(II)	搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
	T19		C	c 1	T18	

[Drawing 9]



[Drawing 10]

(A)-1

搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
T11	T18	A	a 1	T10	T18

(A)-2

搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
T15	T21	A	a 2	T14	T22

(B)

搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
T13	T17	B	b 1	T12	T18, T22

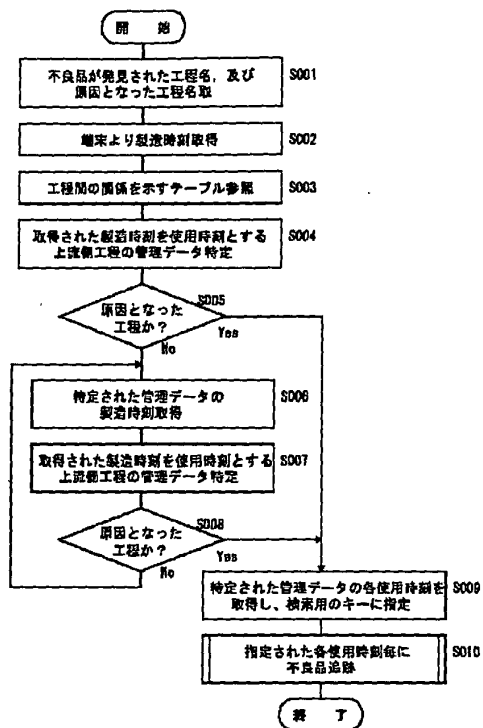
(C)-1

搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
T19	T24	C	c 1	T18	T29

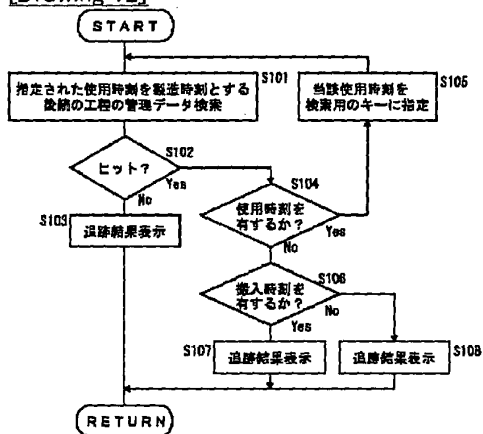
(C)-2

搬出時刻	搬入時刻	工程名	箱記号	製造時刻	使用時刻
T23	T27	C	a 2	T22	

[Drawing 11]



[Drawing 12]



[Translation done.]